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ABSTRACT

This report describes the results of Connecticut's second statewide assessment of mathematical knowledge, skills and attitudes. The Connecticut Assessment of Educational Progress, annually tests a sample of Connecticut students in grades 4, 8, and 11 in one or more subject areas. Students at each grade level were randomly selected to participate in the mathematics assessment. The CAEP assessment is designed to provide results by size of community, sex and regions within the State. National Assessment of Educational Progress (NAEP) items were used to provide comparisons with achievement levels of students in the nation and in the Northeast Region. Results on repeated items from the first Connecticut mathematics assessment in 1976-77 provide an important review of student progress over time. The report reveals continuing and serious problems with certain mathematics skills, but significant improvement can be noted in others. Overall, longitudinal comparisons are encouraging in grade 4. The results and recommendations in this report assist the statewide local school districts in planning for curriculum improvement, and will be used to monitor Connecticut's progress toward meeting the State Board Objectives for Public Education. (Author/GK)

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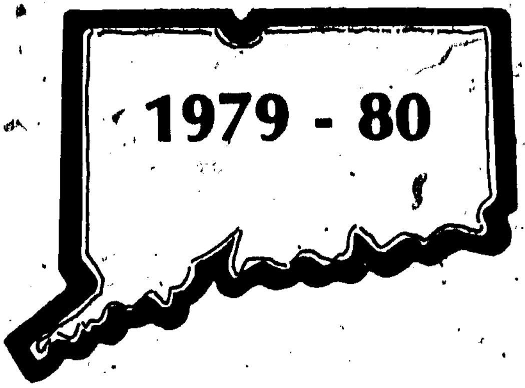

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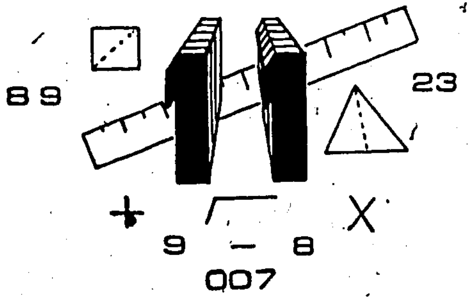

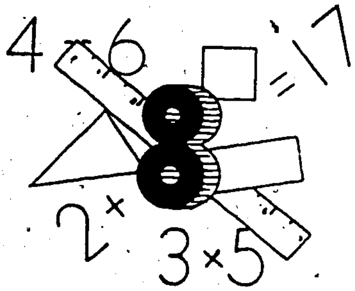

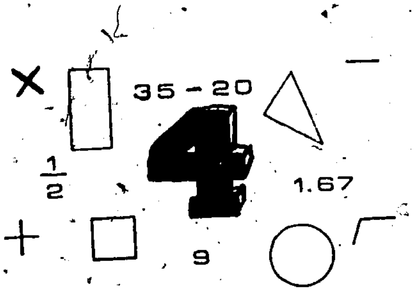

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SUMMARY AND INTERPRETATIONS

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Connecticut Assessment of Educational Progress
Mathematics
1979-80

SUMMARY and INTERPRETATIONS REPORT

Prepared by:

Martin S. Wolfe

Mathematics Education Center
School of Education
The University of Connecticut

Prepared for:

Connecticut State Board of Education
Bureau of Research, Planning and Evaluation

November, 1980

Annual Report Series: BRPE-81-3B

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STATE OF CONNECTICUT
STATE BOARD OF EDUCATION

This report describes the results of our second statewide assessment of mathematical knowledge, skills and attitudes. Conducted as part of the on-going Connecticut Assessment of Educational Progress (CAEP), the 1979-80 mathematics assessment provides important achievement information on the academic proficiency of students in the area of mathematics.

The Connecticut Assessment of Educational Progress annually tests a sample of Connecticut students in grades 4, 8 and 11 in one or more subject areas. Approximately 7,500 students - 2,500 at each grade level - were randomly selected from 282 Connecticut Public Schools in 115 school districts to participate in the mathematics assessment. At the same time, over 15,000 students from 33 school districts and the 17 vocational-technical schools also volunteered to participate in this assessment for their own purpose.

The CAEP assessment is designed to provide results by size of community, sex and regions within the State. Where possible, National Assessment of Educational Progress (NAEP) items were used to provide comparisons with achievement levels of students in the nation and in the Northeast Region. Further, results on repeated items from the first Connecticut mathematics assessment in 1976-77 provide an important review of student progress over time.

Although the report reveals continuing and serious problems with certain mathematics skills, significant improvement can be noted in others. Overall, longitudinal comparisons are encouraging in grade 4 where small but decided improvement has occurred. Moreover, when examined in relation to the results on Connecticut's Ninth Grade Proficiency Test, the assessment confirms a need for continued improvement, and clearly identifies specific areas of strengths and weaknesses.

The results and recommendations contained in this report assist the statewide local school districts in planning for curriculum improvement. At the state level, these results will be used to monitor our progress toward meeting the State Board Objectives for Public Education and to develop programs of technical assistance to local school districts.

The 1979-80 Connecticut Assessment of Educational Progress in mathematics was sponsored by the Connecticut State Department of Education, conducted by the Mathematics Education Center of the University of Connecticut, and made possible by the time and effort of students, teachers and administrators throughout the state. The cooperation of all participants is greatly appreciated.

Sincerely,

Mark R. Shedd
Commissioner of Education

MRS:ks

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PART I: THE CAEP MATHEMATICS PROGRAM

INTRODUCTION

Background and Purpose

The Connecticut Assessment of Educational Progress (CAEP) in Mathematics, 1979-80, was the second assessment of mathematical knowledge, skills, and attitudes conducted as part of Connecticut's continuing CAEP program. The previous mathematics assessment was conducted in 1976-77. Both mathematics assessments involved samples drawn from Connecticut's public schools of 9-year-olds in grade 4, 13-year-olds in grade 8, and 17-year-olds in grade 11. The CAEP program, including the 1979-80 mathematics assessment, has been modeled after the National Assessment of Educational Progress (NAEP).

The 1979-80 mathematics assessment was conducted by the Mathematics Education Center and the Bureau of Educational Research, School of Education of the University of Connecticut (UConn) under contract to the Connecticut State Department of Education (CSDE). A Statewide Mathematics Advisory Committee (SMAC) consisting of Connecticut educators worked with UConn and CSDE throughout the project.

The goals of the 1979-80 mathematics assessment were:

(1) to determine the performance in mathematics of Connecticut public school students from the state as a whole, from various regions of the state, and from various community sizes;
(2) to compare the 1979-80 performance with the 1976-77 performance;
(3) to compare the 1979-80 performance of Connecticut students with that of students in the Northeast and in the nation;
(4) to provide performance data useful in making curriculum and instruction decisions at both the state and local levels;
(5) to encourage local school districts to adopt objective-referenced assessment instruments and procedures for evaluation and planning.

The Statewide Mathematics Advisory Committee, in conjunction with CSDE and UConn, designed three objective-referenced tests, one for each age/grade level in the assessment. Test items were selected to measure the various objectives developed by SMAC. Wherever appropriate, items from the 1976-77 CAEP test and items from NAEP materials were included. In addition, SMAC developed student questionnaires to be administered with the tests.

The 1979-80 assessment, in addition to testing the statewide sample, provided a "Local Option" in which local districts could elect to have students in grade 4, 8, and/or 11 tested using the instruments developed for the statewide sample. Over 15,000 students from 33 local school districts and 17 vocational-technical schools participated in the Local Option phase of the assessment.

The 1976-77 CAEP Mathematics Assessment

The present assessment (hereafter referred to as "CAEP-2") was closely modeled after the 1976-77 CAEP mathematics program ("CAEP-1"). A number of CAEP-1 items were included on the CAEP-2 assessment instruments in order to provide data for longitudinal comparisons. Such comparisons are presented in Part II of this report.

The NAEP Mathematics Assessment

The CAEP mathematics assessment was designed as an adaptation of the model used at the national level by NAEP. The first NAEP mathematics project ("NAEP-1") was conducted in 1972-73, and a second ("NAEP-2") in 1977-78.

NAEP has conducted both mathematics assessments with samples consisting of 9-year-olds, 13-year-olds, and 17-year-olds from across the United States participating. The samples were selected in such a way that the results of the assessments could be generalized to the national populations of the participating age groups. Thirteen-year-olds were assessed by NAEP toward the beginning of the school year; 9-year-olds at about mid-year; and 17-year-olds toward the end of the school year. NAEP reported results for various groups within the national population including groups defined by sex, geographic region of the country, and the size of the community in which a school is located.

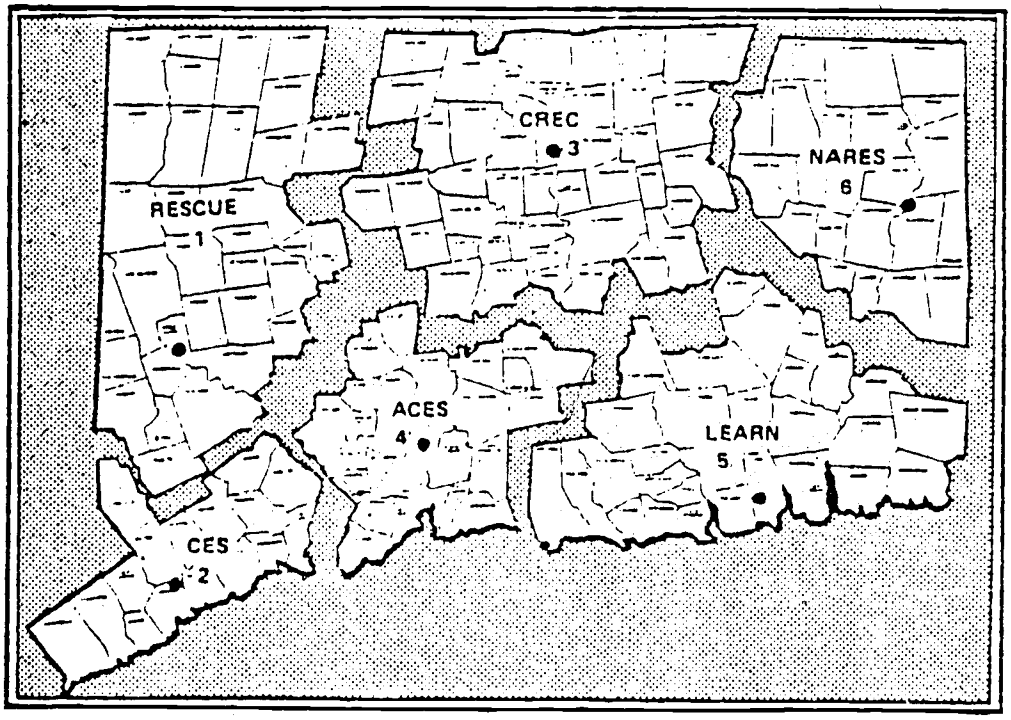
A number of NAEP-2 items were included on the CAEP-2 instruments in order to provide data for comparison of the performance of Connecticut students with that of students in the Northeast and in the nation. Such comparisons are presented in Part II of this report.

SAMPLE SELECTION

A sample of Connecticut students at each of the three age/grade levels was tested. The CAEP program for 1979-80 included assessments in mathematics and in science. In an effort to minimize interruptions caused by assessment procedures to local school programs, it was agreed among CSDE, UConn, and National Evaluation Systems (contractor for the science assessment) that National Evaluation Systems would draw the samples for both assessments in such a manner as to assure that any given school would not be selected for both samples. The sampling procedure and all subsequent procedures were designed to protect the anonymity of all students, schools, and school districts participating in the statewide sample.

At each age/grade level, students were randomly selected for the sample on the basis of their school's location in Connecticut and the size of the town in which their school is located. Each geographic region and each size of community category was represented in a particular age/grade sample proportionately to its representation in the state population of that age/grade group.

The map below shows the division of the state into regions based on the six Connecticut Regional Educational Services Centers. Each region is identified in the key below the map.



• Location of office

Region 1: Regional Educational Services Concepts (through) Unified Effort (RESCUE)
Region 2: Cooperative Educational Services (CES)
Region 3: Capital Region Educational Council (CREC)
Region 4: Area Cooperative Educational Services (ACES)
Region 5: Project LEARN (LEARN)
Region 6: Northeast Area Regional Educational Services (NARES)

The sizes of community for Connecticut were defined as follows:

1 - Big Cities.	Towns of more than 100,000 population
2 - Fringe Cities.	Towns whose borders are contiguous with Big Cities and whose populations exceed 10,000
3 - Medium Cities.	Towns of more than 25,000 population which are not Big Cities or Fringe Cities
4 - Smaller Cities.	All other towns

The number of students who participated in the statewide assessment was:

2505 nine-year-olds in grade 4
2575 thirteen-year-olds in grade 8
2440 seventeen-year-olds in grade 11

The number of schools represented in the sample was:

115 schools at the 4th grade level
93 schools at the 8th grade level
74 schools at the 11th grade level (including 8 vocational-technical schools)

The total number of school districts represented in the sample was 115.

THE ASSESSMENT INSTRUMENTS

The Statewide Mathematics Advisory Committee first developed goal areas and objectives for each age/grade level and then three objective-referenced tests based on these goals and objectives. The objectives represent those mathematical concepts and skills judged to be of highest priority for each grade level. No attempt was made to include all concepts and skills typically included in the experiences of students at each grade level. Goal areas, objectives, and test item numbers for each of the three age/grade levels are presented in Tables 1-3.

Items were selected to provide for various comparisons. First priority was given to items from the CAEP-1 (1976-77) test. In addition some NAEP-2 (1977-78) items were selected by SMAC. In cases where appropriate items were not available from either CAEP-1 or NAEP-2, new items were prepared by UConn for SMAC's approval. Some items were designated to be administered to more than one age group. At least three items were used for each age 9 objective and at least four items were used for each age 13 and each age 17 objective.

Sources of mathematics items were as follows:

Age 9/Grade 4

CAEP-1	36
NAEP-2	11
CAEP-2 ("new" items)	13
Total mathematics items	60

(8 of the CAEP-1 items were originally NAEP-1 items.)

Age 13/Grade 8

CAEP-1	34
NAEP-2	17
CAEP-2 ("new" items)	19
Total mathematics items	70

(10 of the CAEP-1 items were originally NAEP-1 items.)

Age 17/Grade 11

CAEP-1	41
NAEP-2	13
CAEP-2 ("new" items)	15
Total mathematics items	69

(11 of the CAEP-1 items were originally NAEP-1 items.)

Field tests were conducted for each assessment instrument to gather item data and to test the appropriateness of the administrative process. Several hundred students at each grade level participated in the field tests. The field tests were administered under the same conditions as those planned for the statewide assessment. The field tests confirmed the judgement of SMAC as to the reliability of the selected items and the soundness of the administrative procedures.

Questionnaires were developed for the three age/grade levels in order to provide data on the attitudes of various groups of students toward mathematics and to identify characteristics of students which might prove useful in local and/or statewide policy decisions. In order to provide for comparisons, some CAEP-1 items were selected for the CAEP-2 questionnaire and some NAEP-2 items were modified slightly and included. Results of the student questionnaires and comparative data are provided later in this report.

Sources of questionnaire items were as follows:

Age 9/Grade 4

CAEP-1	3
NAEP-2	6
CAEP-2 ("new" items)	1
Total questionnaire items	10

Age 13/Grade 8

CAEP-1	3
NAEP-2	7
CAEP-2 ("new" items)	4
Total questionnaire items	14

Age 17/Grade 11

CAEP-1	4
NAEP-2	7
CAEP-2 ("new" items)	7
Total questionnaire items	18

TABLE 1

CAEP GOAL AREAS, OBJECTIVES, AND ITEM NUMBERS FOR 9-YEAR-OLDS, MATHEMATICS, 1979-80

GOAL AREA OBJECTIVE	TEST ITEM NUMBER
1. Math Concepts	
1.1 The student demonstrates an understanding of place values for whole numbers.	30, 36, 42, 46, 53
1.2 The student demonstrates an understanding of ordering of whole numbers.	19, 32, 38, 56
1.3 The student demonstrates an understanding of fractional notation.	20, 29, 39, 55
2. Computation	
2.1 The student demonstrates the ability to add whole numbers.	1, 5, 8, 10, 11
2.2 The student demonstrates the ability to subtract whole numbers.	2, 4, 7, 12, 16
2.3 The student demonstrates the ability to multiply whole numbers with one digit multipliers.	3, 9, 13, 17
2.4 The student demonstrates the ability to divide whole numbers with one digit divisors.	6, 14, 15, 18
3. Measurement	
3.1 The student demonstrates the ability to convert U.S. currency to equivalent units.	34, 37, 50, 57
3.2 The student demonstrates the ability to identify and compute time.	33, 40, 47, 54
3.3 The student demonstrates a working knowledge of linear units of U.S. and metric measure.	35, 41, 43, 49, 51, 58
4. Tables and Graphs	
4.1 The student demonstrates the ability to interpret data from tables and graphs.	44, 45, 48, 60
5. Application/Problems	
5.1 The student demonstrates the ability to solve word problems.	21, 22, 23, 24, 25, 26, 27, 28
6. Geometry	
6.1 The student demonstrates the ability to identify and name plane geometric figures.	31, 52, 59

TABLE 2

CAEP GOAL AREAS, OBJECTIVES, AND ITEM NUMBERS FOR 13-YEAR-OLDS, MATHEMATICS, 1979-80

GOAL AREA OBJECTIVE	TEST ITEM NUMBER
1. Math Concepts	
1.1 The student demonstrates an understanding of numbers in fraction, decimal and percent form.	21, 32, 48, 55
1.2 The student demonstrates the ability to order decimals, fractions, and whole numbers.	51, 56, 57, 62
2. Computation	
2.1 The student demonstrates the ability to add and subtract whole numbers.	1, 7, 8, 11
2.2 The student demonstrates the ability to multiply and divide whole numbers.	2, 3, 19, 20, 23, 24
2.3 The student demonstrates the ability to add and subtract decimals.	12, 13, 15, 34
2.4 The student demonstrates the ability to multiply and divide decimals.	4, 16, 17, 22, 28
2.5 The student demonstrates the ability to add and subtract fractions and mixed numbers.	5, 6, 9, 26
2.6 The student demonstrates the ability to multiply and divide fractions and mixed numbers.	14, 18, 29, 30, 31
2.7 The student demonstrates the ability to use percent.	10, 25, 27, 45
3. Measurement	
3.1 The student demonstrates the ability to find area and perimeter.	47, 49, 68
3.2 The student demonstrates the ability to convert a U.S. unit of measure to an equivalent unit of measure.	33, 50, 52, 67
3.3 The student demonstrates knowledge of metric units of measure.	46, 58, 59, 63, 65
4. Tables and Graphs	
4.1 The student demonstrates the ability to interpret data from tables and graphs.	54, 60, 66, 70
5. Applications/Problems	
5.1 The student demonstrates the ability to solve word problems.	35, 36, 37, 38, 39, 40, 41, 42, 43, 44
6. Geometry	
6.1 The student demonstrates knowledge of basic geometric concepts.	53, 61, 64, 69

TABLE 3

CAEP GOAL AREAS, OBJECTIVES, AND ITEM NUMBERS FOR 17-YEAR-OLDS, MATHEMATICS, 1979-80

GOAL AREA OBJECTIVE	TEST ITEM NUMBER
1. Math Concepts	
1.1 The student demonstrates an understanding of numbers in fraction, decimal and percent form.	24, 32, 46, 48
1.2 The student demonstrates the ability to order decimals, fractions.	45, 56, 58, 66
2. Computation	
2.1 The student demonstrates the ability to add and subtract whole numbers.	1, 7, 8, 11
2.2 The student demonstrates the ability to multiply and divide whole numbers.	2, 3, 20, 21, 22, 27
2.3 The student demonstrates the ability to add and subtract decimals.	12, 13, 15, 26
2.4 The student demonstrates the ability to multiply and divide decimals.	4, 16, 17, 30
2.5 The student demonstrates the ability to add and subtract fractions and mixed numbers.	5, 6, 9, 29
2.6 The student demonstrates the ability to multiply and divide fractions and mixed numbers.	14, 18, 19, 31
2.7 The student demonstrates the ability to use percent.	10, 23, 28, 44
3. Measurement	
3.1 The student demonstrates the ability to find area, perimeter, and volume.	49, 52, 55, 61
3.2 The student demonstrates the ability to convert a U.S. unit of measure to an equivalent unit of measure.	25, 50, 54, 65
3.3 The student demonstrates knowledge of metric units of measure.	47, 57, 60, 62, 68
4. Tables and Graphs	
4.1 The student demonstrates the ability to interpret data from tables and graphs.	51, 53, 64, 69
5. Applications/Problems	
5.1 The student demonstrates the ability to solve word problems.	34, 35, 36, 37, 38, 39, 40, 41, 42, 43
6. Geometry	
6.1 The student demonstrates knowledge of basic geometric concepts.	33, 59, 63, 67

ADMINISTRATION OF THE INSTRUMENTS

The calendar for the CAEP-2 assessment was essentially the same as that used by both NAEP and CAEP-1; testing was conducted during October-November for 13-year-olds in grade 8, during February-March for 9-year-olds in grade 4, and during April-May for 17-year-olds in grade 11. Testing sessions were limited to sixty minutes for the full assessment instrument and were conducted at times mutually agreed upon by local school personnel and UConn representatives. The instruments were administered by test administrators trained by UConn.

School districts participating in the Local Option had opportunities to have local personnel trained in testing procedures at workshops conducted by UConn personnel.

ANALYSIS OF RESULTS

Part II of this report provides the following:

(1) results by total test, goal area, and objective
(2) achievement comparisons among various groups of Connecticut students
(3) comparisons of Connecticut with the Nation and the Northeast
(4) comparisons across CAEP-2 age groups
(5) comparisons between CAEP-2 and CAEP-1
(6) results and comparisons of the student questionnaire

Results for each individual mathematics item by age/grade level, sex, region, size of community, and, where applicable, CAEP-1 or NAEP-2 are presented in the appendix. For more detailed descriptions of procedures and results, the reader may consult the Technical Report of the 1979-80 Mathematics Assessment prepared for the Connecticut State Board of Education, Bureau of Research, Planning and Evaluation.

INTERPRETATION OF RESULTS

Results for individual mathematics items are reported as the percentage of students in the statewide sample who answered the items correctly.

Results for categories such as objectives, goal areas, and total test are reported as the average of the percentages correct of the individual items included in the categories. All percentages have been rounded to the nearest whole number in order to simplify the reading of various tables, charts, and discussions, and to reflect the degree of precision which is probably most appropriate.

The results have been obtained from a statewide probability sample at each age/grade level. As such, they may be considered as good estimates of the results which would have been obtained from the corresponding population (e.g., all Connecticut public school 13-year-olds in grade 8). It is highly probable that the population results would not be more than two percentage points higher or lower than the sample results reported herein.

Many of the results are presented in formats which make it convenient to compare performances between and among various groups. It should be noted, however, that three different assessment instruments were used in obtaining the results, one for each age/grade level. Hence, it would be invalid to compare differences between age/grade groups in categories such as objectives, goal areas, or total test. However, individual item comparisons between age/grade groups may be made where items were common to both tests.

Small differences between groups are probably not educationally significant. Hence, the discussion of results in Part III will highlight only differences larger than two percentage points. "Statistically significant differences" are technical in nature and could be subject to misinterpretation in the context of this summary; such differences are noted in the Technical Report only.

PART II: SUMMARY OF RESULTS

CONNECTICUT CAEP-2 RESULTS

Introduction

Tables 1-3 presented earlier in this report list the mathematics goal areas and objectives which the CAEP-2 instruments were designed to measure. Results by goal area and objective for each of the age/grade levels are described in this section. Results by individual item are given in an appendix.

Each CAEP mathematics goal area or objective was measured by a set of items matched to that goal area or objective. An individual item result is the percentage of students who answered the item correctly. Figure 1 shows the average percentage for all items on the test and, for each goal area, the average percentage of items matched to the goal area which were answered correctly by the 9-, 13-, and 17-year-olds respectively. For example, in Figure 1, the 9-year-olds show an average percentage of 74 for the Math Concepts goal area. This means that the average percentage of items answered correctly by 9-year-olds in the state sample in the Math Concepts goal area was 74%. Figures 2-4 provide achievement results by objective.

The reader is reminded that different assessment instruments were used for the different age levels. Hence, comparisons across age levels would not be valid.

Results for 9-Year-Olds/Grade 4

The total test average for 9-year-olds was 77%. Performance on goal areas ranged from a high of 86% on geometry to a low of 63% on tables and graphs.

Achievement by 9-year-olds was 80% or above on seven of the thirteen objectives, with the highest being 87% on Objective 3.1, Money. Performance on the four objectives concerned with whole number computations ranged from 80% to 84%. The lowest performance was 63% on Objective 4.1, Tables and Graphs.

Results for 13-Year-Olds/Grade 8

The total test average for 13-year-olds was 70%. The range of goal area performance was from 75% for both computation and geometry to 61% for mathematics concepts.

Achievement by 13-year-olds on fifteen objectives ranged from 92% on Objective 2.1, Whole Number Addition and Subtraction to 53% on two objectives, Objective 1.2, Ordering and Objective 2.7, Percent. Their performance was above 80% on two objectives in addition to Objective 2.1: 88% on Objective 2.2, Whole Number Multiplication and Division, and 84% on Objective 2.3, Decimal Addition and Subtraction.

Results for 17-Year-Olds/Grade 11

The total test average for 17-year-olds was 75%. Goal area performance ranged from 82% for tables and graphs to 60% for geometry.

Performance by 17-year-olds on fifteen objectives ranged from a high of 94% on Objective 2.1, Whole Number Addition and Subtraction to a low of 60% on Objective 2.7, Percent, and Objective 6.1, Geometric Concepts. Also at the high end was Objective 2.3, Decimal Addition and Subtraction (91%).

FIGURE 1

Achievement on Goal Areas by Age Group

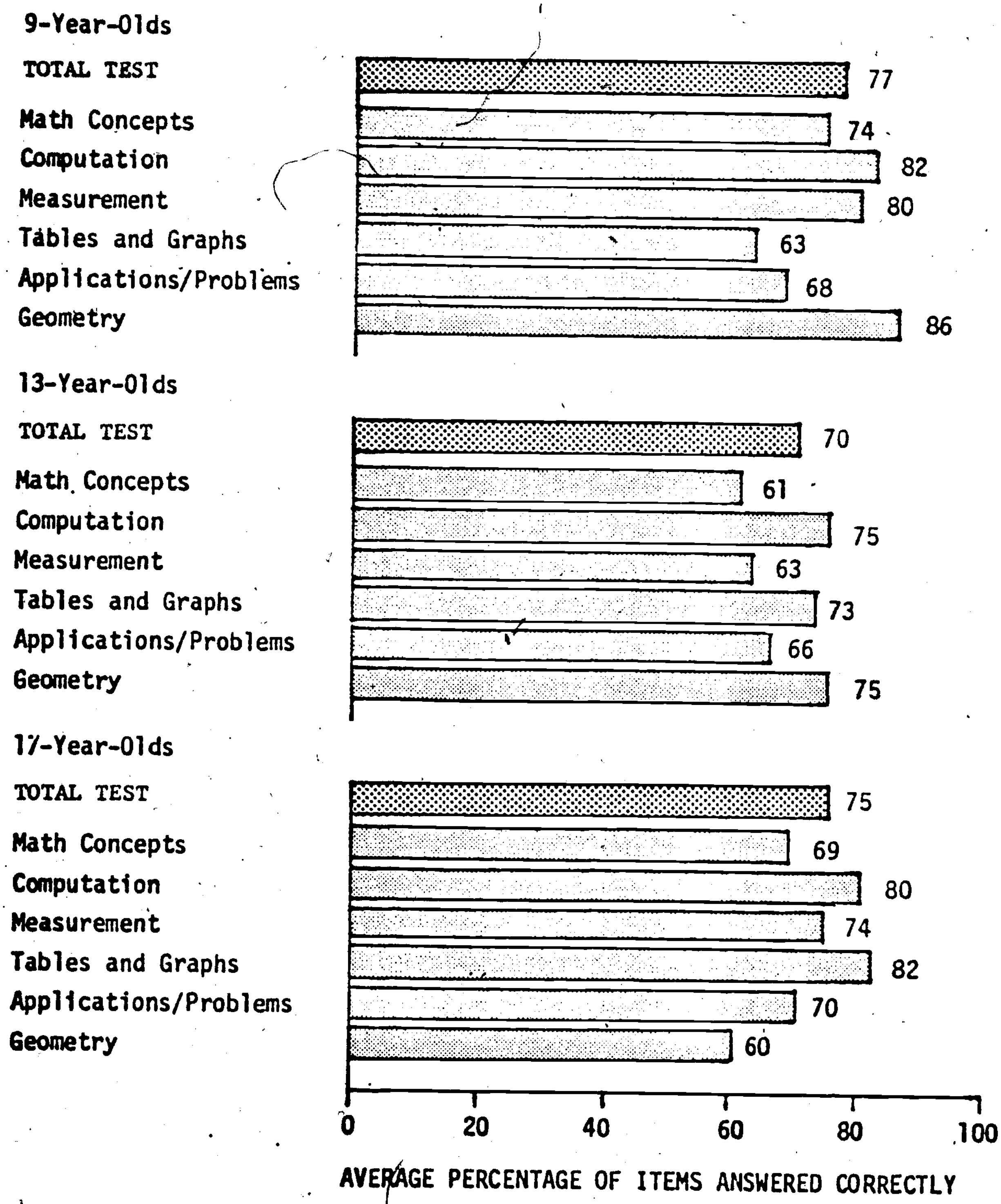


FIGURE 2

Achievement on Objectives: 9-Year-Olds

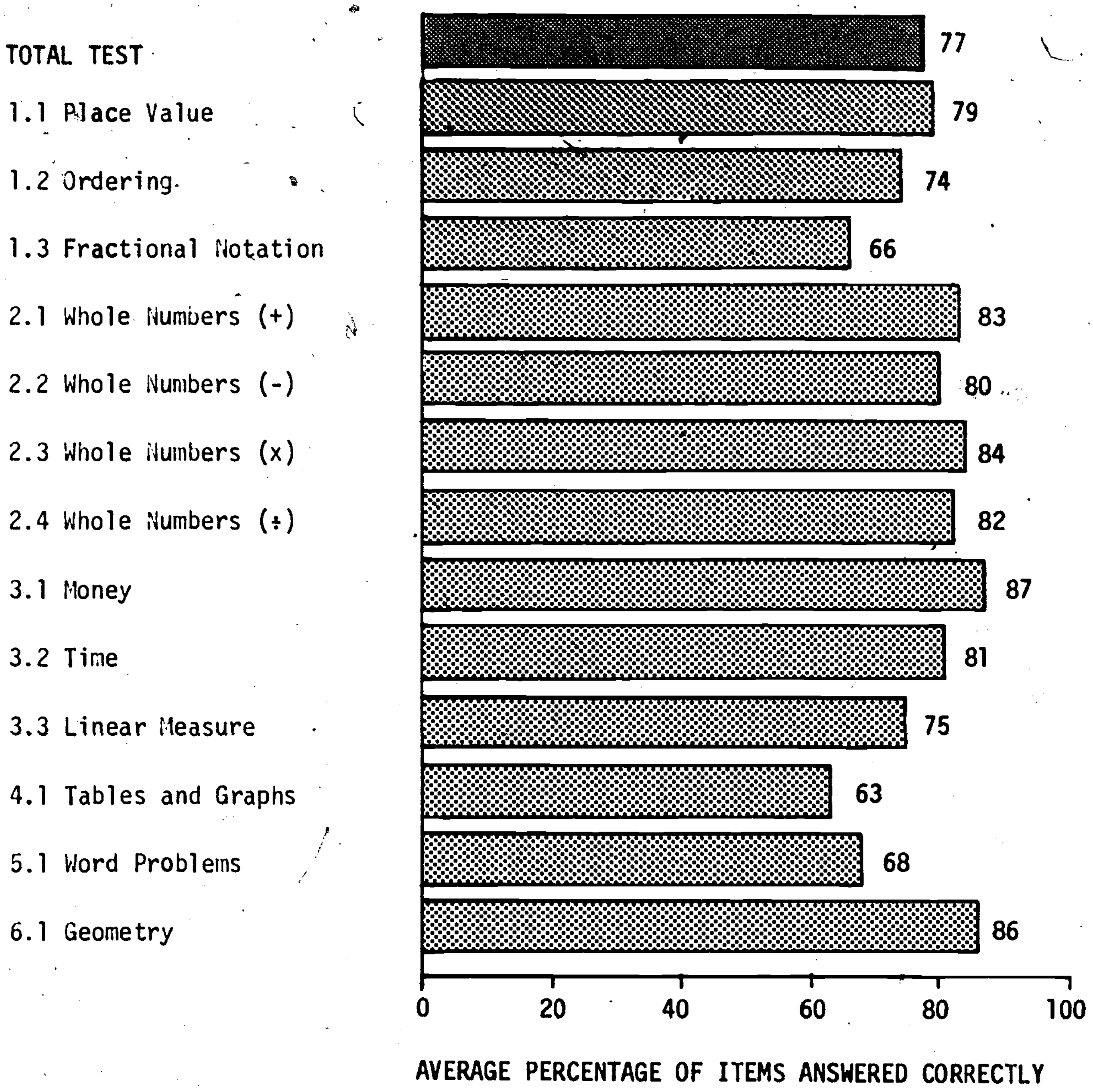


FIGURE 3

Achievement on Objectives: 13-Year-Olds

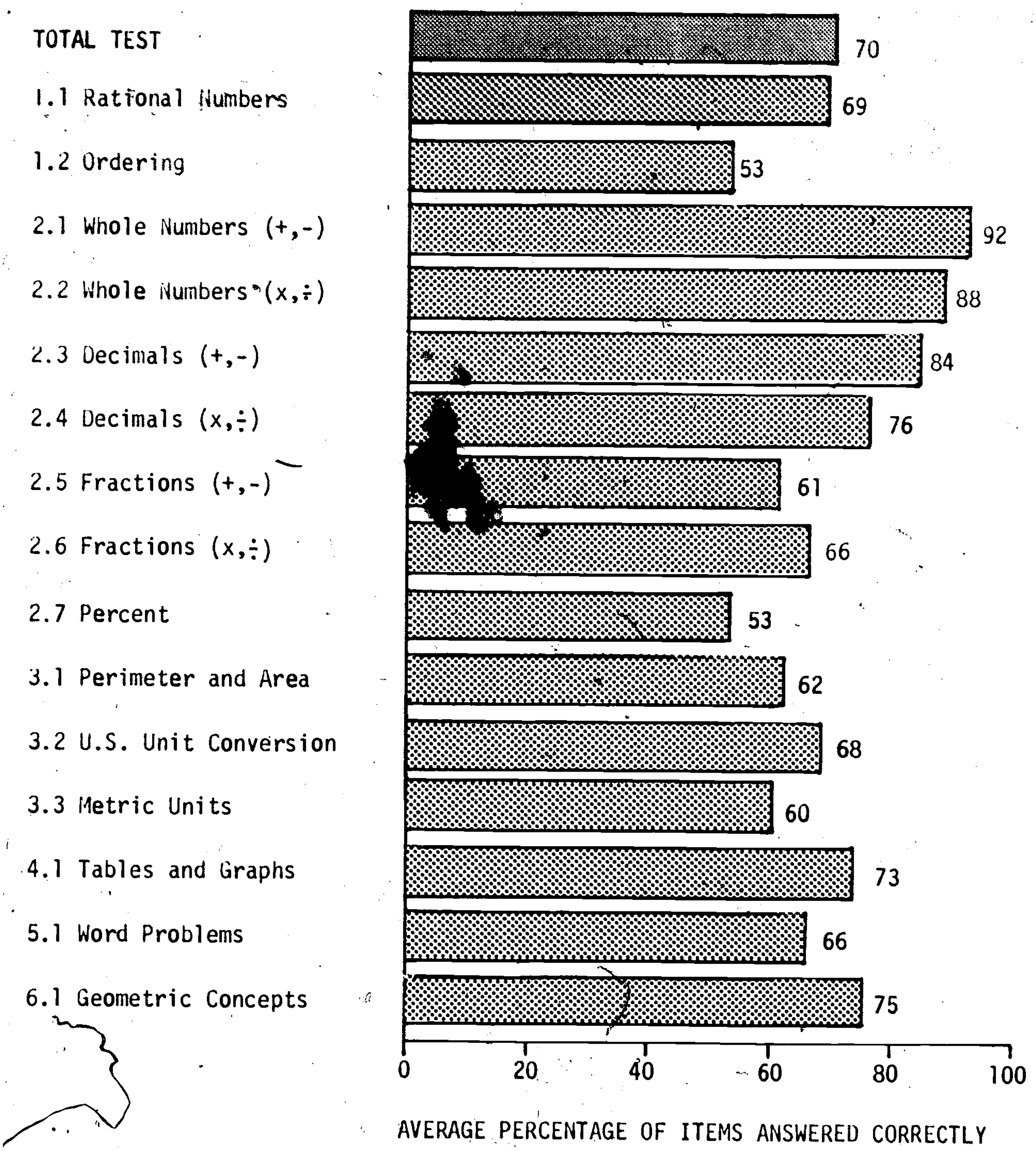


TABLE 8

Achievement on Total Test by Reporting Groups

Questionnaire Items	Average Percentage of Items Answered Correctly on Total Test		
	9-Year-Olds	13-Year-Olds	17-Year-Olds
ALL STUDENTS	77	70	75
Male	76	71	78
Female	77	69	72
MATH MORE FOR BOYS THAN GIRLS			
Yes	68	65	72
No	78	71	74
Undecided	76	68	69
IMPORTANT TO KNOW MATH TO GET GOOD JOB	NA*		
Yes		70	73
No		64	69
Undecided		72	71
MATH USEFUL SOLVING PROBLEMS IN EVERYDAY LIFE	NA		
Yes		71	74
No		59	66
Undecided		68	70
MATH IS BORING			
Yes	77	67	66
No	78	70	77
Sometimes	77	70	72
MATH UPSETS ME			
Yes	69	60	63
No	78	71	77
Sometimes	74	69	70
MATH MORE FOR GIRLS THAN BOYS			
Yes	71	59	65
No	78	71	74
Undecided	77	68	69

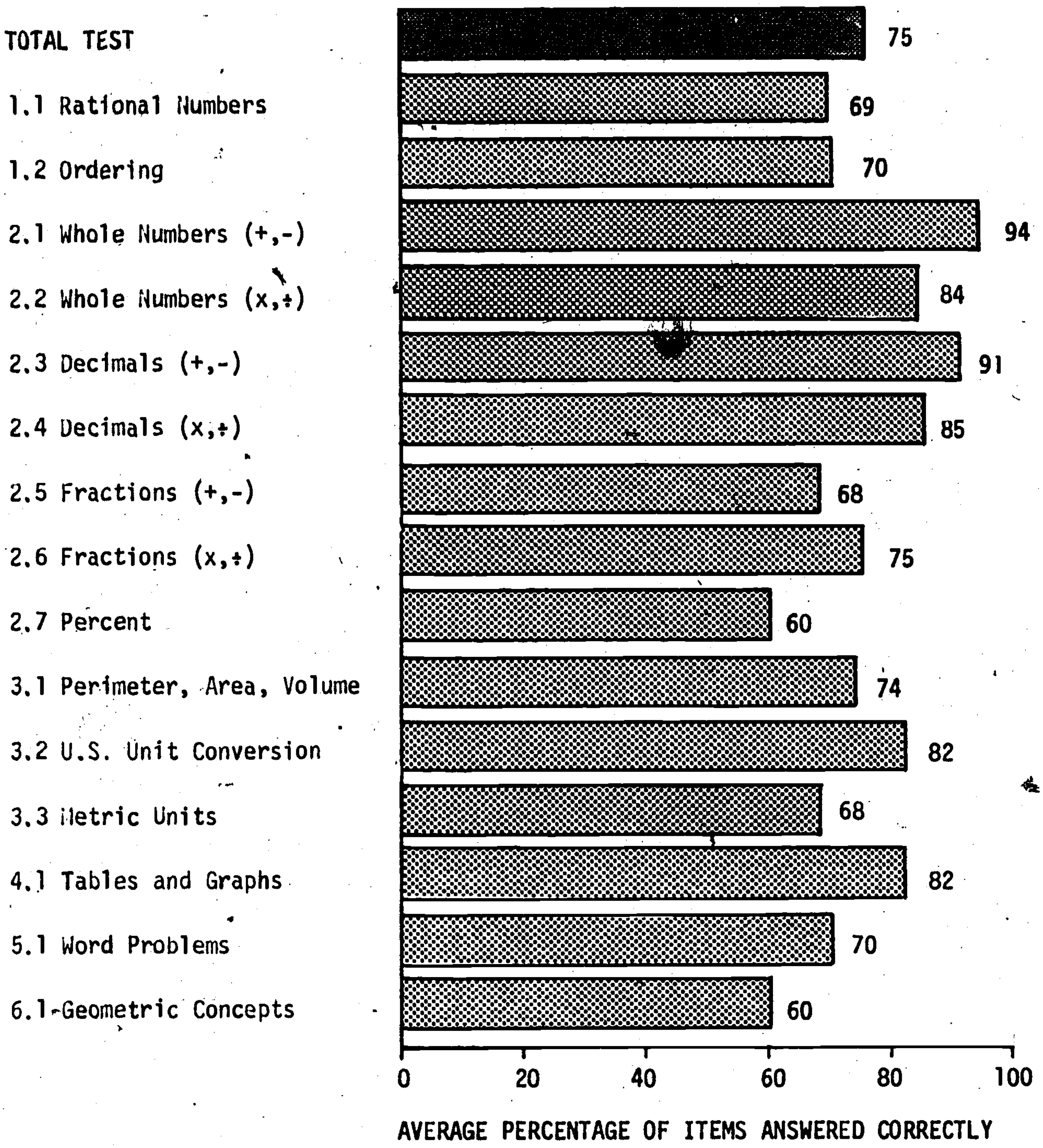
*NA = Not Applicable. (The item was not used with this age group.)

TABLE 8 (continued)

Questionnaire Items	Average Percentage of Items Answered Correctly on Total Test		
	9-Year-Olds	13-Year-Olds	17-Year-Olds
HOW OFTEN USED HAND CALCULATOR			
Often	73	71	76
Never	75	65	65
Sometimes	79	71	72
YOU OR FAMILY OWN HAND CALCULATOR			
Yes	78	71	73
No	69	59	62
I don't know	68	57	65
I USUALLY UNDERSTAND MATH			
Yes	78	70	75
No	64	61	63
Undecided (Age 9 only)	70		
TAKE MATH ONLY BECAUSE I HAVE TO	NA		
Yes		66	66
No		72	76
HOW HARD ARE MATH COURSES	NA		
Easier than most		72	80
About same as most		69	72
Harder than most		69	69
HOURS PER DAY OF TV			
Less than 1	75	73	77
Between 1 and 2	79	74	74
Between 2 and 3	79	70	71
Between 3 and 4	79	68	69
More than 4	73	63	59
HOW MUCH DO YOU LIKE MATH			
Very much	77	71	82
Somewhat	78	70	72
Not at all	70	65	64

FIGURE 4

Achievement on Objectives: 17-Year-Olds



ACHIEVEMENT COMPARISONS AMONG VARIOUS GROUPS OF CONNECTICUT STUDENTS

Region

Figure 5 presents results for the 9-, 13-, and 17-year-olds by region. For each age group, the average for all students is given, followed by the average for all students except those in Big Cities. The region averages were calculated with Big Cities omitted from their regions. Big Cities were not included in the region data since data from previous Connecticut assessments have indicated that the scores of Big City students tend to differ from others in the regions.

At the 9-year-old level, the average for all students on the total test was 77%, while the average for all students minus those in Big Cities was 79%. The regions differed very little in achievement on the total test.

The average for all 13-year-old students on the total test was 70%; the average for all minus the Big City students was 73%. The highest performance by 13-year-olds was 76% in Region 2, with Regions 3 and 5 very close to that figure at 74% each. At the low end of the range were Region 6 at 67% and Region 4 at 70%. Performance in Region 1 was 72%.

For all 17-year-olds, the total test average was 75%; the average for all minus Big City students was 77%. Regional performance by 17-year-olds ranged from 82% for Region 2 to 74% for Region 4.

Size of Community

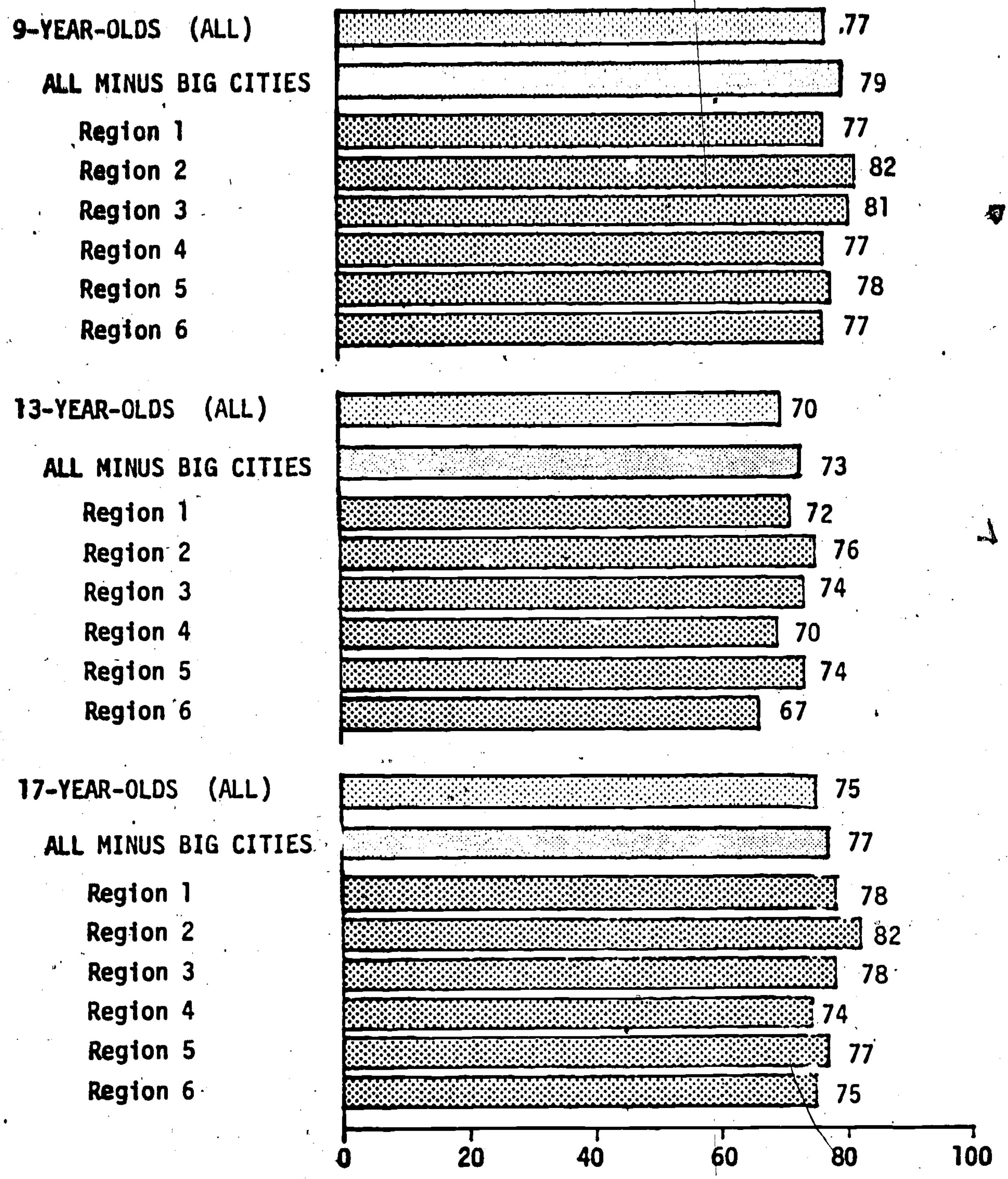
The reader is reminded of the definitions of the various sizes of community used for the CAEP assessments:

1 - Big Cities.	Towns of more than 100,000 population
2 - Fringe Cities.	Towns whose borders are contiguous with Big Cities and whose populations exceed 10,000
3 - Medium Cities.	Towns of more than 25,000 population
4 - Smaller Cities.	All other towns

The 9-, 13-, and 17-year-old achievement results by size of community were similar to each other in that Fringe Cities, Medium Cities, and Smaller Cities all had averages within a few percentage points of their respective state averages while Big Cities has averages which were 13 to 15 percentage points below their respective state averages.

FIGURE 5

Achievement on Total Test by Region*

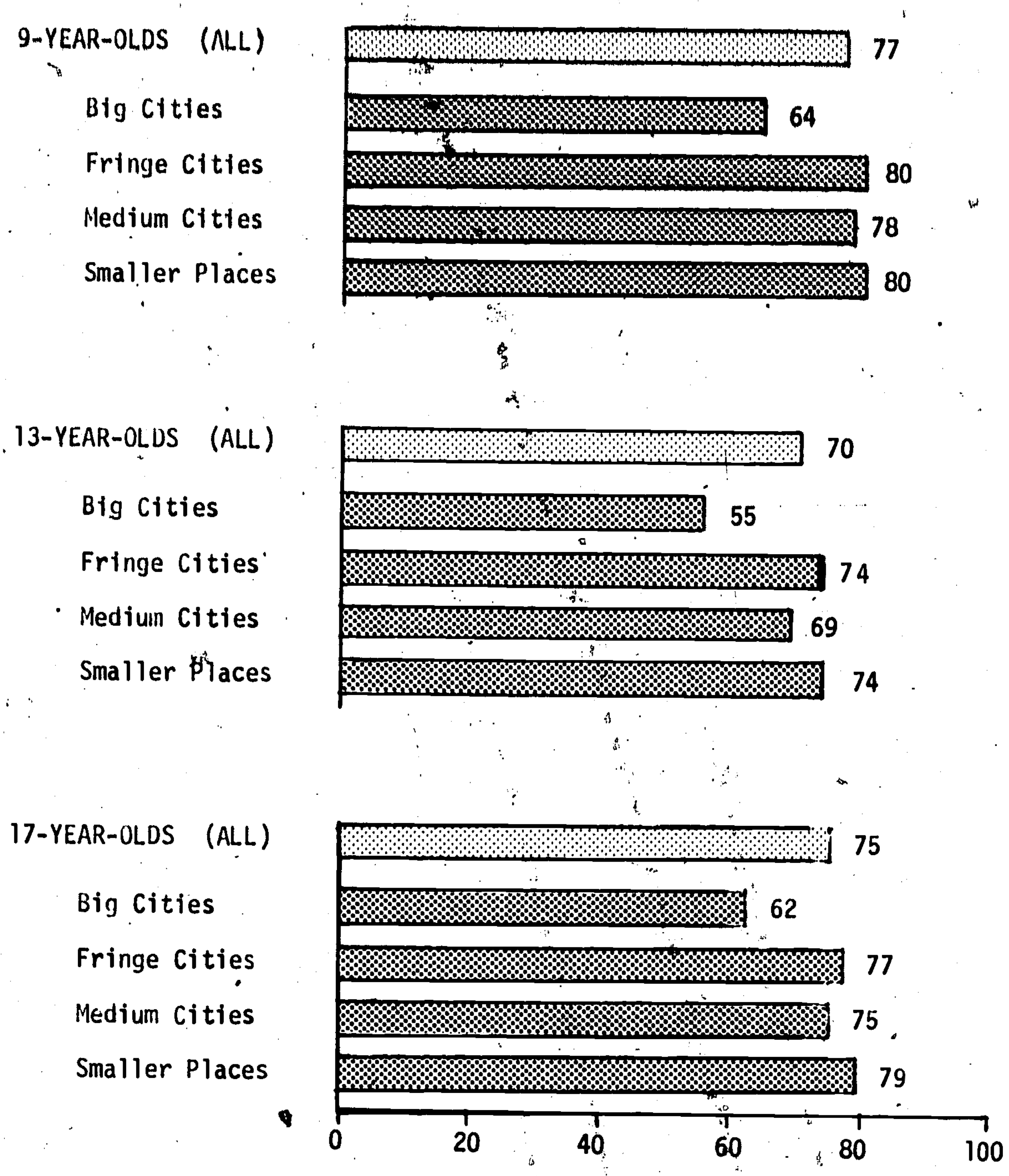


AVERAGE PERCENTAGE OF ITEMS ANSWERED CORRECTLY

*Results for all students include Big Cities. Results by region do not include Big Cities because the scores of Big City students tend to differ from those of students in their respective regions according to information from previous assessments in Connecticut.

FIGURE 6

Achievement on Total Test by Size of Community



AVERAGE PERCENTAGE OF ITEMS ANSWERED CORRECTLY

COMPARISONS OF CONNECTICUT WITH THE NATION AND THE NORTHEAST

Introduction

In this section, the achievement results obtained for Connecticut students are compared with results obtained by the National Assessment of Educational Progress in Mathematics, 1977-78 (NAEP-2). The NAEP-2 results represent students in the nation and in NAEP's Northeast region which includes the following states, Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Washington, D.C.

For detailed information on NAEP, the reader is referred to National Assessment of Educational Progress, Education Commission of the States, Suite 700, 1860 Lincoln Street, Denver, Colorado 80295. NAEP Report No. 09-MA-01, "Changes in Mathematical Achievement, 1973-78" states the following on Page 1:

> What happened to mathematics achievement during that time? When all items were considered together, 9-year-olds' performance declined very slightly; the decline for 13-year-olds was slightly larger and the decline for 17-year-olds was appreciable.

The same NAEP report presents an analysis of results by a panel of persons concerned with mathematics education. The panel stated that results for whole number computation were satisfactory, that performance was high, and that declines were offset by gains during the period of comparisons. The panel was concerned with the low overall performance on problem-solving and with the decline in this area from 1973 to 1978. On Page 25 of the report, the following is stated:

> A number of factors were seen as contributing to these declines. As noted previously, the emphasis on "back-to-the-basics" has often resulted in a narrowing of the curriculum, with more attention focused on computational skills and knowledge of facts and definitions and less time spent on problem-solving. As Wilson stated, "Children are given very little opportunity to get into problem-solving activities." Carl concurred: "Back-to-the-basics has stripped youngsters of the chance to practice problem-solving skills."

The mathematics items common to the NAEP-2 and the CAEP-2 tests were exactly the same on both tests. However, there was a difference in how the items were administered; timed audiotapes to accompany the tests were used by NAEP but not by CAEP. The effects of this difference, if any, would be difficult to identify. However, it seems reasonable to assume that the audiotapes provided an advantage on some items for NAEP students who are poor readers as compared to their Connecticut counterparts.

Figures 7-9 display the results for 9-, 13-, and 17-year-olds respectively for Connecticut, the Nation, and the Northeast. Both CAEP-2 and NAEP-2 results are for 9-year-olds in grade 4, 13-year-olds in grade 8, and 17-year-olds in grade 11.

Results for 9-Year-Olds/Grade 4

There were 11 mathematics items common to the CAEP-2 and the NAEP-2 tests for 9-year-olds. The averages for all common items were 72% for Connecticut, 57% for the Nation, and 62% for the Northeast.

In all goal areas, Connecticut students performed at a higher level than both the national and the Northeast students. The largest differences between Connecticut results and national results were 21 percentage points in Mathematics Concepts and 20 percentage points in Computation. Connecticut students were higher than their Northeast counterparts by 18 percentage points in the Goal Area of Computation and by 14 percentage points in Mathematical Concepts. Connecticut results were only slightly higher than those for the Northeast in the remaining goal areas.

Results for 13-Year-Olds/Grade 8

Seventeen items were shared by the CAEP-2 and the NAEP-2 mathematics tests for 13-year-olds. The averages for these shared items were 65% for Connecticut, 63% for the Nation, and 66% for the Northeast.

Connecticut students performed at about the same level as the national students and as the Northeast students in four of the six CAEP goal areas. For the two remaining goal areas, Connecticut students were slightly higher in the Measurement area and lower by 9 percentage points than the national students and lower by 14 percentage points than the Northeast students in the Tables and Graphs area. It should be noted that in each of these two goal areas, the results are based on only one item.

Results for 17-Year-Olds/Grade 11

There were 13 items shared by CAEP-2 and NAEP-2. The average for these shared items was 72% for Connecticut, 69% for the Nation, and 70% for the Northeast.

On seven Computation items, Connecticut students averaged 74% compared to 68% and 69% for the nation and the Northeast region respectively. In Geometry, Connecticut, at 60%, was 8 and 7 percentage points higher than the nation and the Northeast respectively. For the Goal Area of Applications/Problems, the performances were essentially the same. For Mathematical Concepts, Connecticut students performed 4 percentage points below those in the nation and 7 percentage points below those in the Northeast. The Connecticut, nation, and Northeast comparison was 75%, 80%, and 81% respectively in the Goal Area of Tables and Graphs.

FIGURE 7

Performances by 9-Year-Olds on NAEP-2 Items Connecticut, Nation, Northeast

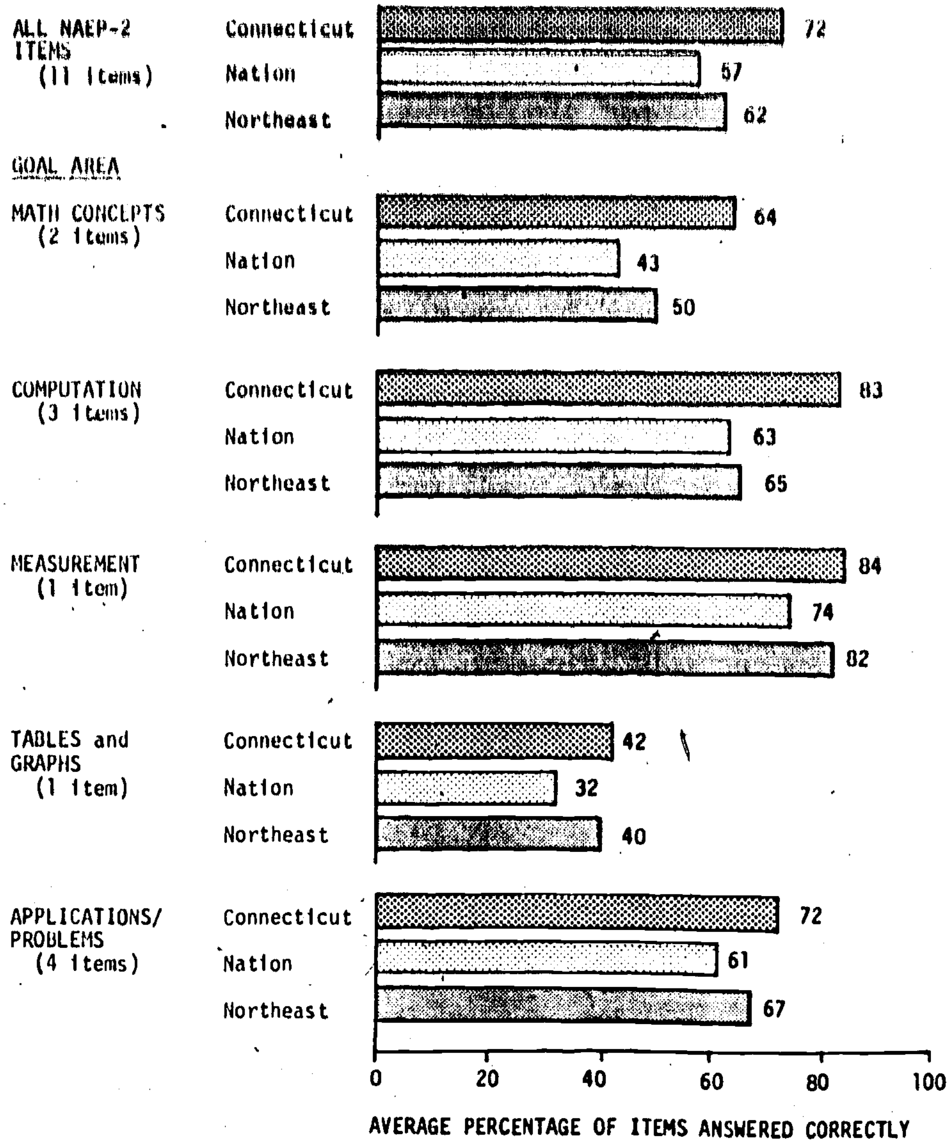


FIGURE 8

Performances by 13-Year-Olds on NAEP-2 Items Connecticut, Nation, Northeast

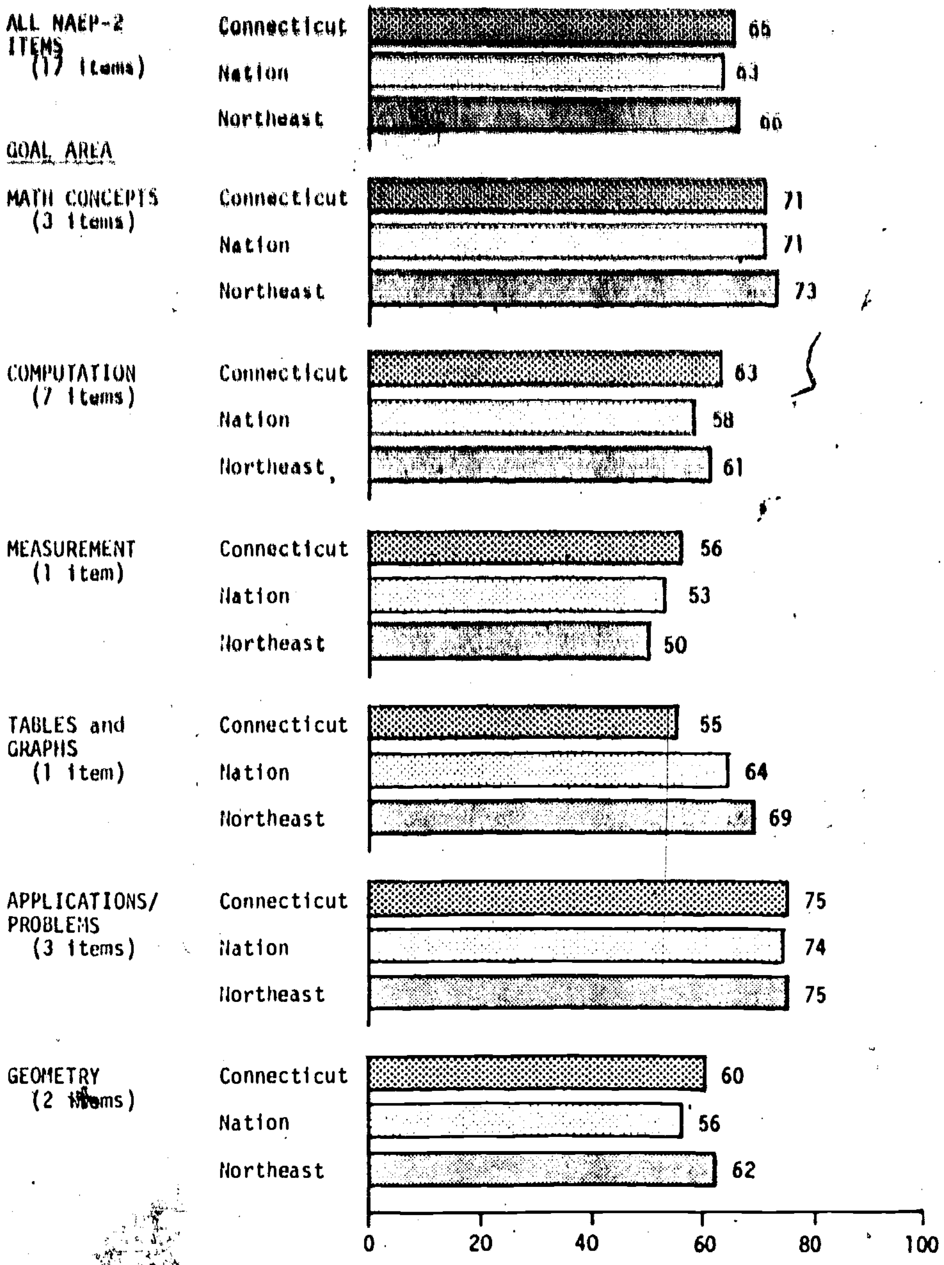
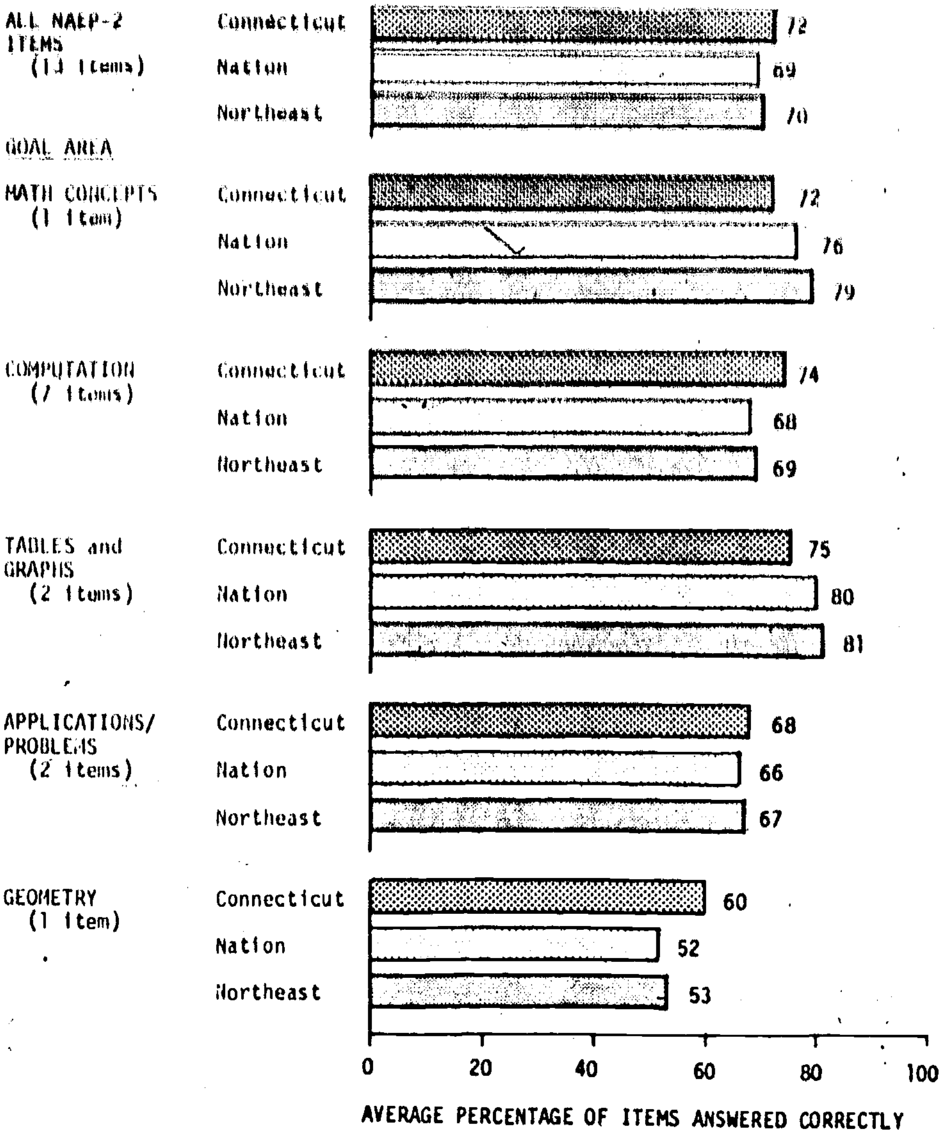


FIGURE 9

Performances by 17-Year-Olds on NAEP-2 Items
Connecticut, Nation, Northeast



ACHIEVEMENT ACROSS AGE GROUPS

Eleven items were shared by 9- and 13-year-olds, eight of which were shared by all three age groups. The most extensive item sharing was by 13- and 17-year-olds with 36 items common to both in addition to the eight already mentioned. Table 4 presents a comparison of achievement across age groups on shared items grouped by goal areas.

The Whole Number Objectives with the Goal Area of Computation were the only objectives with enough shared items (4) for a reasonable comparison across all three age levels. On two addition items and one subtraction item, all three age groups performed at a high level with 13- and 17-year-old percentages in the 90's and 9-year-old percentages ranging from 80 to 93. On one subtraction item involving "borrowing" in two places, the difference was more pronounced with 9-, 13-, and 17-year-old results being 60%, 88% and 92%, respectively.

In other goal areas, 9-year-olds had 16 items shared with one or both of the other age groups. For these items, the 9-year-olds scored from 6 to 38 percentage points lower than 13-year-olds with the largest differences indicated for an item asking about a "fractional part" of a rectangle and an item involving the reading of a table matching shoe sizes with sock sizes.

Forty-four items were shared by 13- and 17-year-olds across all goal areas. The results for 26 of these items differed by 10 percentage points or less, with the results for 17-year-olds usually a bit higher than those for 13-year-olds. The differences for four remaining items in the Goal Area of Mathematical Concepts ranged from 18 to 28 percentage points with the results for 17-year-olds consistently the higher. Six of the remaining items were in the Goal Area of Computation and dealt with decimals, fractions, or percent. The range of differences for these six items was from 11 to 23 percentage points in favor of the 17-year-olds. Three remaining items in the Goal Area of Measurement and one in the area of reading Tables and Graphs showed differences in results ranging from 12 to 23 percentage points with the results for 17-year-olds higher in all cases. For the Goal Area of Applications/Problems, the size of the differences in results between the two age groups on the four remaining items ranged from 16 to 27 percentage points in favor of the 17-year-olds.

TABLE 4

Comparison of Achievement Across Age Groups on Shared Items by Goal Areas

Item Number: Age 9	Item Number: Age 13	Item Number: Age 17	GOAL AREA and Description of Item	Percentage of Students Scoring Correctly: Age 9	Age 13	Age 17
			MATHEMATICAL CONCEPTS			
20	21		What fractional part of rectangle shaded?	52	90	
	32	24	1/5 is equal to what %?		44	62
	48	48	0.009 equals what fraction?		72	79
56	51		Which number is greatest? (Whole numbers)	69	82	
	56	56	Order fractions, 1/4, ____, 3/8		24	52
	57	58	Which fraction is least?		54	75
	62	66	Which number is greatest? (Decimals)		53	72
			COMPUTATION (Whole Numbers)			
1	1	1	826 + 786 =	93	96	96
	2	2	609 x 73 =		94	93
	3	3	714 ÷ 7 =		80	76
7	7	7	1054 - 865 =	60	88	92
8	8	8	43 + 71 + 75 + 92 =	81	92	94
12	11	11	36 - 19 =	80	94	94
	20	20	671 x 402 =		75	83
9	23		48 x 4[illegible]	77	94	
			COMPUTATION (Decimals, Fractions Percent)			
	4	4	425 x 0.33 =		88	94
	5	5	2 3/8 + 3 7/8 =		64	77
	6	6	5/6 - 1/3 =		51	65
	9	9	1/2 + 1/3 =		52	68
	10	10	30 is what % of 60?		43	61
	12	12	7.54 + 1.52 =		84	92
	13	13	If 23.8 subtracted from 62.1		74	85
	14	14	2/3 x 3/4 =		78	86
	15	15	$10.00 - 1.98 =		91	93
	16	16	1.29 x 0.06 =		71	81
	17	17	1.96 ÷ 0.04 =		67	77
	18	18	4 1/2 x 3 =		68	77
	25	23	What is 4% of 75?		23	46
10	34	26	$3.06 + 10.00 + 9.14 + 5.10 =	55	87	93

TABLE 4 (continued)

AGE IN YEARS Item Number			GOAL AREA and Description of Item	AGE IN YEARS Percentage of Students Scoring Correctly		
9	13	17		9	13	17
			MEASUREMENT			
	47	55	Perimeter of given 10 by 6 rectangle		56	66
	49	49	Area of given 6 by 2 rectangle		51	72
	33	25	1 1/2 lbs. = ____ ounces		50	73
	50	50	30 in. = ____feet____inches		78	88
	52	54	8 quarts = ____ gallons		67	79
	67	65	140 min. = ____hrs.____min.		79	87
	46	47	Best measure for gasoline tank (liter)		79	89
	58	57	Eight kilograms equal how many grams?		39	45
51	59	60	Best measure between two cities (kilometer)	49	69	74
	63	62	Smallest unit? (milligram)		67	77
	65	68	357 centimeters equal how many meters?		49	53
			TABLES and GRAPHS			
48	54	53	Read size table for socks	47	83	91
	66	64	Read unemployment graph		71	84
			APPLICATIONS/PROBLEMS			
	36	35	To job at 7:45 a.m., returned home 10 hrs. later at what time?		72	88
	38	39	What is 6% sales tax on $200 TV set?		60	83
	39	40	Mr. J. fenced his 10 by 6 feet rectangular garden. How much fencing used?		44	62
	41	42	J. received 120 votes, M. received 80. What % of total did J. receive?		34	61
26	44	43	Cost of 3 items from given menu	88	94	95

NOTE: There were no shared items for the goal area of Geometry.

COMPARISONS BETWEEN CAEP-2 AND CAEP-1

Introduction

A major objective of the 1979-80 CAEP mathematics program (CAEP-2) was to provide data which could be compared to data obtained in the 1976-77 CAEP mathematics program (CAEP-1). With this objective in mind, the Statewide Mathematics Advisory Committee gave high priority to the selection of items from the CAEP-1 assessment instrument for the CAEP-2 test. In addition, testing conditions and all other aspects of the CAEP-2 program were modeled on the CAEP-1 program as closely as possible.

Figures 10-12 display the average percentage of items common to CAEP-1 and CAEP-2 answered correctly by the 9-, 13-, and 17-year-olds respectively.

Results for 9-Year-Olds

There were 36 mathematics items common to CAEP-1 and CAEP-2 at the 9-year-old level; this represented 60% of the 60 CAEP-2 items. The averages for all common items combined were 79% for CAEP-2 and 76% for CAEP-1.

The performance by CAEP-2 9-year-olds was essentially the same as their CAEP-1 counterparts for three of the six goal areas: Mathematical Concepts, Measurement, and Tables and Graphs. For the Goal Area of Computation, the CAEP-2 results were higher by six percentage points with an average of 81% compared to 75%. The CAEP-2 results were also higher in the Goal Area of Applications/Problems with an average of 66% compared to 59% for CAEP-1. The CAEP-2 Goal Area of Geometry was not assessed on the CAEP-1 test.

Results for 13-Year-Olds

The 34 items common to CAEP-1 and CAEP-2 at the 13-year-old level amounted to 49% of the 70 CAEP-2 mathematics items. The averages for all common items combined were 74% for CAEP-2 and 75% for CAEP-1.

The same six goal areas for 13-year-olds were assessed in CAEP-1 and CAEP-2. Of these, the Goal Area of Computation with 18 common items had essentially the same level of results in each CAEP assessment. Two of the remaining goal areas, Applications/Problems (68% and 71%) and Geometry (91% and 94%) were very close in results with the difference of three percentage points in each case favoring CAEP-1. The results for each of the three remaining goal areas differed by 5 percentage points with the CAEP-1 results higher in each case as follows: Mathematical Concepts, 47% and 52%, Measurement, 66% and 71%, and Tables and Graphs, 83% and 88%.

Results for 17-Year-Olds

There were 41 mathematics items shared by CAEP-1 and CAEP-2 which represented 59% of the 69 CAEP-2 items. The averages for all common items combined were both 77% for CAEP-2 and CAEP-1.

The results were essentially the same for CAEP-1 and CAEP-2 in five of the six goal areas. In the remaining Goal Area of Tables and Graphs, the results differed by only three percentage points on the one shared item and both performances were quite high at 91% and 94% for CAEP-2 and CAEP-1 respectively.

FIGURE 10

Performances by 9-Year-Olds on Items Common to CAEP-2 and CAEP-1 by Goal Area

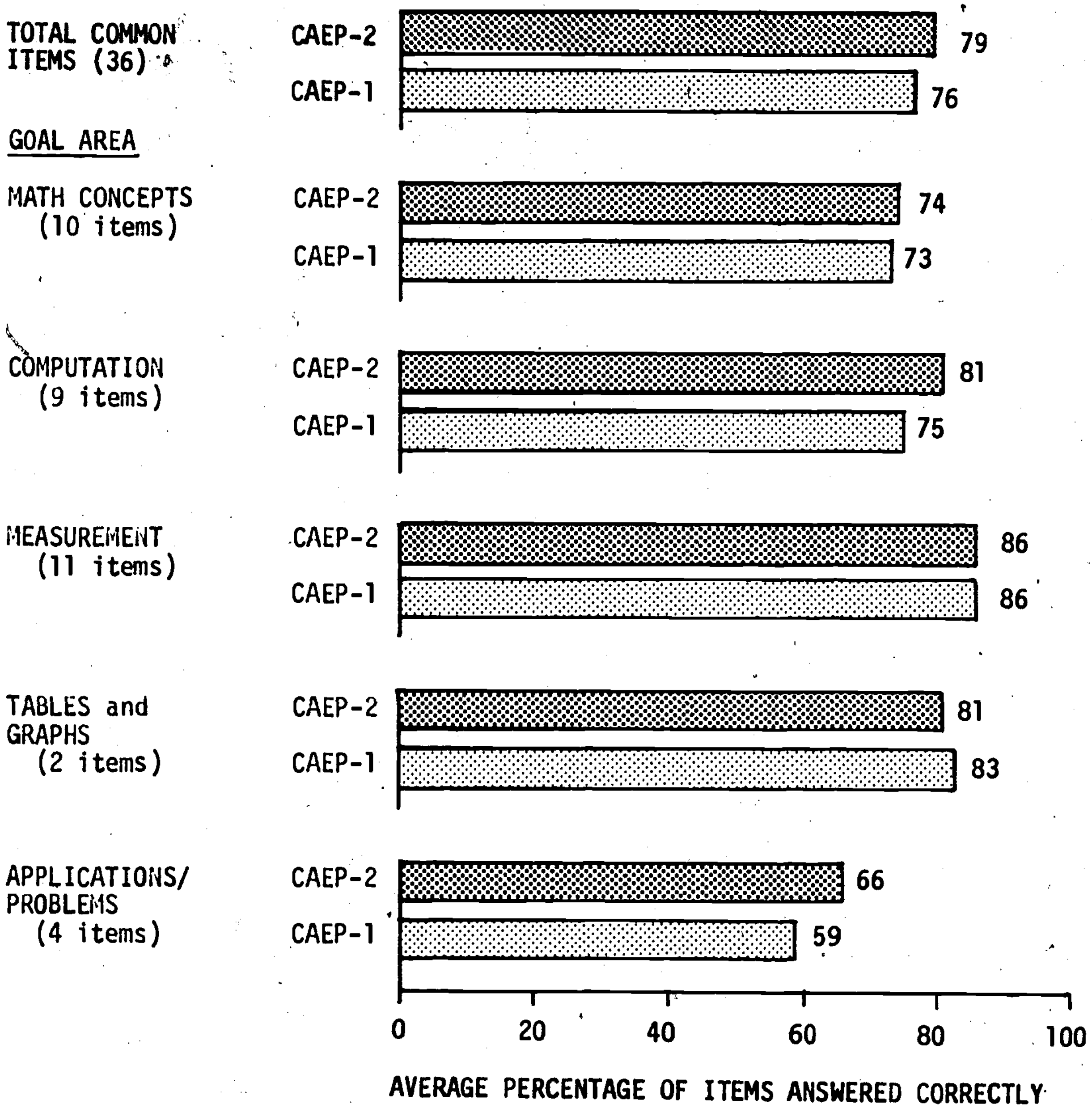


FIGURE 11

Performances by 13-Year-Olds on Items Common to CAEP-2 and CAEP-1 by Goal Area

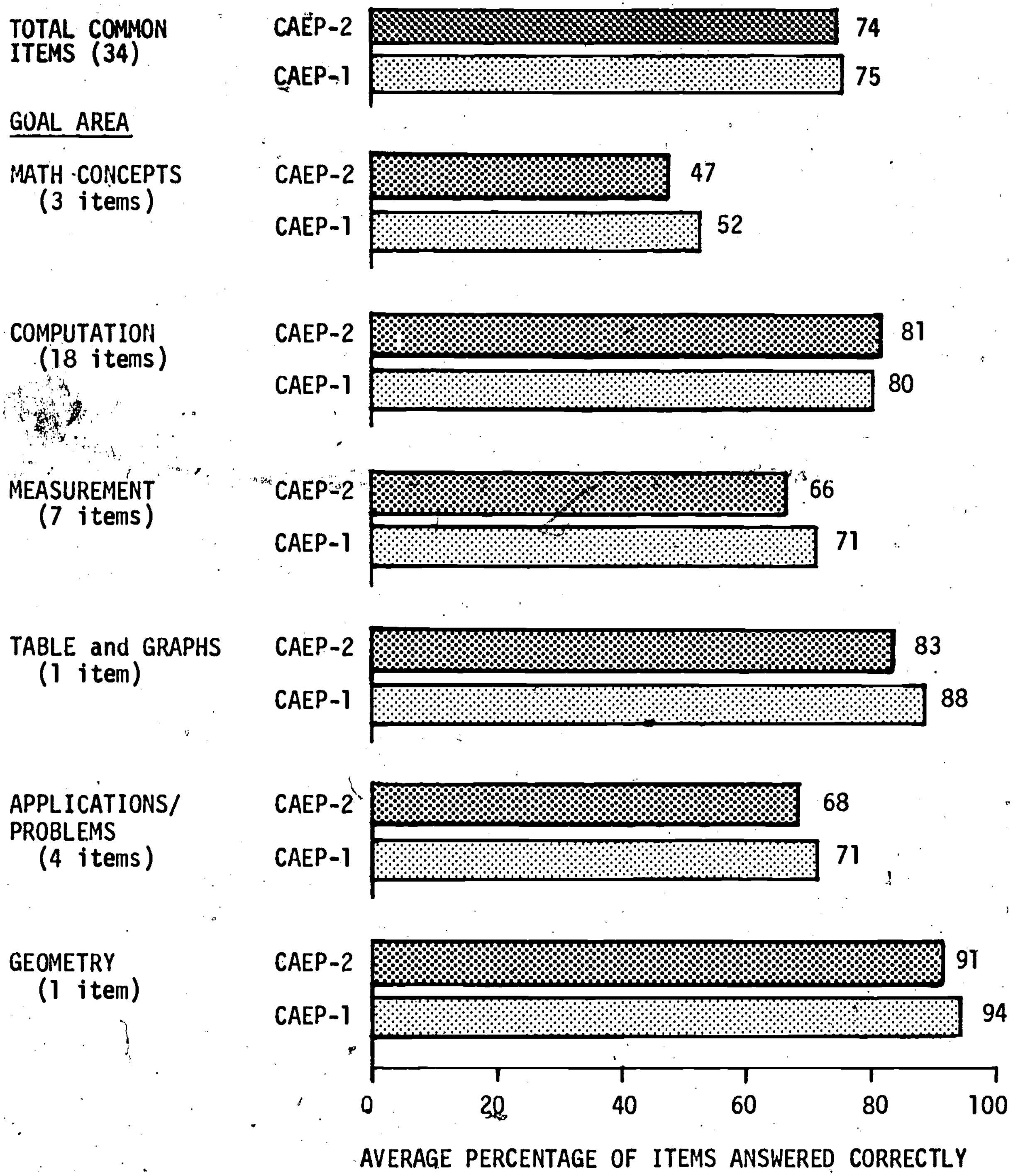
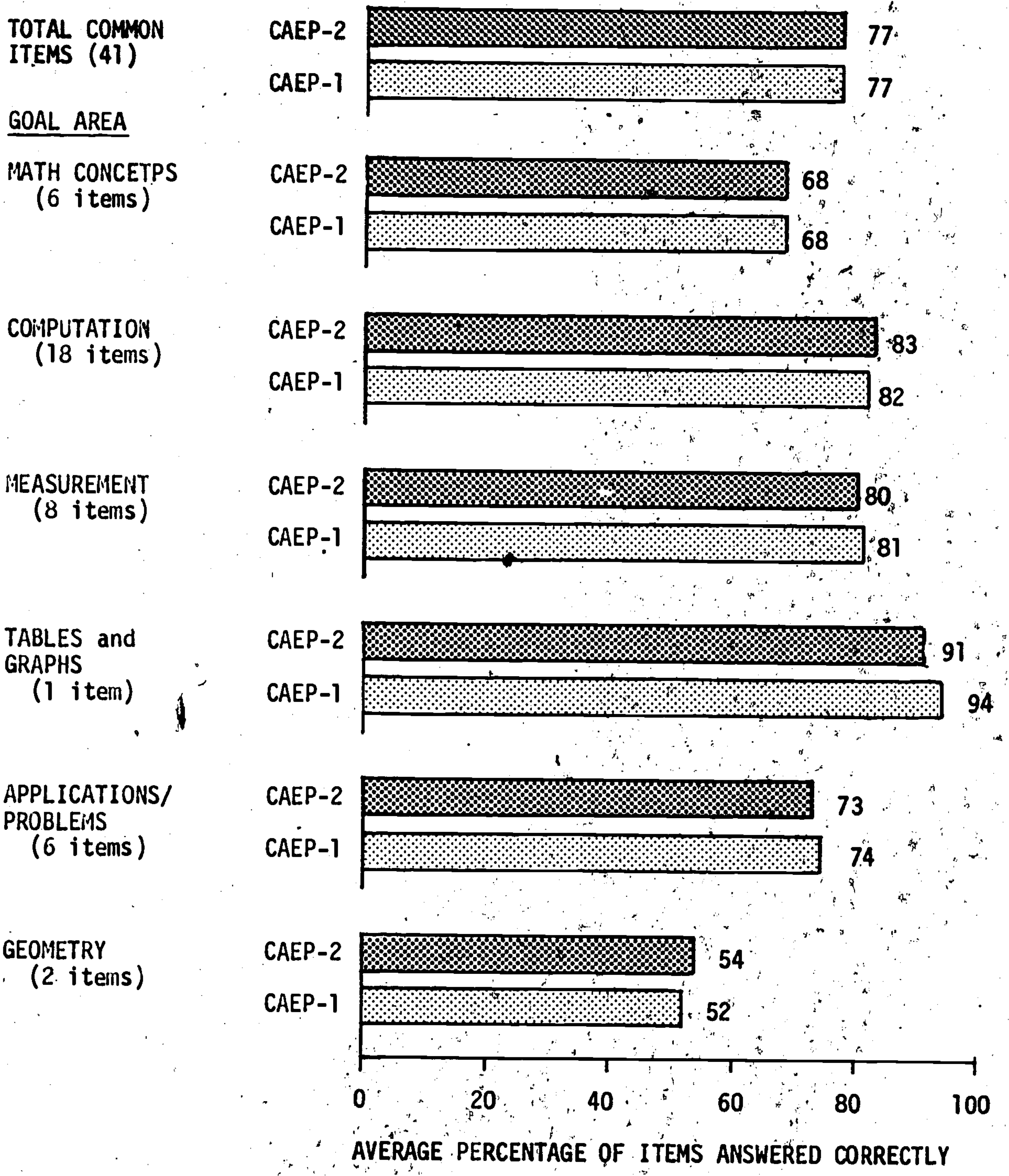


FIGURE 12

Performances by 17-Year-Olds on Items Common to CAEP-2 and CAEP-1 by Goal Area



STUDENT QUESTIONNAIRE RESULTS AND COMPARISONS

Responses to Questionnaire Items

The responses of 9-, 13-, and 17-year-olds to questionnaire items are given in Tables 5, 6, and 7 respectively as percentages selecting various choices. Results for questionnaire items shared with CAEP-1 or with NAEP-2 are included where applicable.

Two questionnaire items at each age level asked students if they felt that mathematics was (1) "more for boys than girls" and (2) "more for girls than boys." Across age levels, very few of either sex said "yes" to either item. The range across age levels for males who said "yes" to (1) was 8% to 12%; for females it was 2% to 4%. For (2), the range for males who said "yes" was 4% to 6%; for females it was 1% (17-year-olds) to 10% (9-year-olds). The same items were used by NAEP with similar results for the national sample.

The use of hand calculators was investigated by both CAEP-2 and NAEP-2. The Connecticut 9-year-olds who reported that they had "never" used a hand calculator constituted 27% of their age group; for 13-year-olds, the figure was lower at 20% and still lower for 17-year-olds at 8%. The NAEP-2 results for the "never" response were 23%, 30%, and 21% for 9-, 13-, and 17-year-olds respectively.

All students were asked, "Do you or does your family own a hand calculator?" The Connecticut responses to this question were "yes" by 85% of 9-year-olds, 87% of 13-year-olds, and 93% of 17-year-olds. At the national level, the responses were a bit lower at 76%, 79%, and 86% for 9-, 13-, and 17-year-olds respectively.

All students were asked to estimate the number of hours per day that they watched television. Those who reported more than four hours per day of TV watching constituted 28% of the 9-year-olds in the CAEP-2 sample and 41% of those in the CAEP-1 sample. There was also a decline in the percentage of 13-year-olds reporting more than four hours of TV watching from 25% for CAEP-1 to 16% for CAEP-2. The percentage of 17-year-olds who reported watching TV for more than four hours per day was low for CAEP-1 at 11% and went even lower for CAEP-2 at 6%. As with CAEP-1, the overall pattern for CAEP-2 indicated that television watching tends to decline as student age increases.

All students were asked, "How much do you like math?" The pattern of responses was essentially the same for both CAEP-2 and CAEP-1. At the 9-year-old level, approximately 50% said, "Very much", while approximately 10% said "Not at all." For 13-year-olds, "Very much" was the choice by approximately 30% and "Not at all" the choice by approximately 10%. For 17-year-olds, the "Very much" choice was made by about 20% and the "Not at all" choice by about 20% with the remainder selecting "Somewhat." The overall pattern in both CAEP-2 and CAEP-1 shows that the amount that students say they like math declines as age increases.

TABLE 5

Responses of 9-Year-Olds to Questionnaire Items Reported in Percentages

Questionnaire Items	All	Sex		CAEP-1	NAEP-2
		M	F	1976-77	1977-78
MATH MORE FOR BOYS THAN GIRLS					
Yes	8	12	4		16*
No	65	56	73		66
Undecided	27	32	23		19
I USUALLY UNDERSTAND MATH					
Yes	84	86	82		39*
No	5	4	5		4
Undecided	11	10	13		57
MATH IS BORING					
Yes	10	12	7		17*
No	51	50	51		52
Sometimes	40	37	42		31
MATH UPSETS ME					
Yes	4	5	3		
No	69	69	70		
Sometimes	27	26	27		
MATH MORE FOR GIRLS THAN BOYS					
Yes	8	6	10		13*
No	66	66	66		66
Undecided	26	28	24		21
HOW OFTEN USED HAND CALCULATOR					
Often	14	15	12		31
Never	27	27	27		23
Sometimes	59	58	60		41

Questionnaire Items	All	Sex		CAEP-1	NAEP-
		M	F	1976-77	1977-
YOU OR FAMILY OWN HAND CALCULATOR					
Yes	85	86	83		76
No	11	10	11		20
I don't know	4	3	5		4
HOURS PER DAY OF TV					
Less than 1	9	7	10	6	
Between 1 and 2	23	19	27	14	
Between 2 and 3	21	19	22	19	
Between 3 and 4	19	20	18	20	
More than 4	28	34	23	41	
HOW MUCH DO YOU LIKE MATH					
Very much	51	52	49	51	
Somewhat	42	40	44	39	
Not at all	7	8	6	10	
HOW USEFUL IS MATH COMPARED TO OTHER SUBJECTS					
Very useful	61	60	62	66	
Somewhat useful	32	32	33	29	
Not very useful	6	8	5	5	

*NAEP-2 response categories used different words, but meanings were essentially the same as the CAEP category words.

TABLE 6

Responses of 13-Year-Olds to Questionnaire Items Reported in Percentages

Questionnaire Items	All	Sex M	 F	CAEP-1 1976-77	NAEP-2 1977-78
MATH MORE FOR BOYS THAN GIRLS					
Yes	5	8	2		2*
No	69	62	75		92
Undecided	26	30	23		5
IMPORTANT TO KNOW MATH TO GET GOOD JOB					
Yes	96	96	96		
No	1	2	1		
Undecided	3	2	3		
MATH USEFUL SOLVING PROBLEMS IN EVERYDAY LIFE					
Yes	85	87	84		79*
No	5	5	5		12
Undecided	10	8	11		9
MATH IS BORING					
Yes	12	13	10		
No	39	43	36		
Sometimes	49	44	54		
MATH UPSETS ME					
Yes	4	5	4		
No	62	65	58		
Sometimes	34	30	38		
MATH MORE FOR GIRLS THAN BOYS					
Yes	3	4	2		5*
No	72	68	75		85
Undecided	25	28	23		10
HOW OFTEN USED HAND CALCULATOR					
Often	11	12	11		23**
Never	20	21	19		30
Sometimes	69	67	71		47

Questionnaire Items	All	Sex M	 F	CAEP-1 1976-77	NAEP-2 1977-78
YOU OR FAMILY OWN HAND CALCULATOR					
Yes	87	86	87		79
No	12	12	12		19
I don't know	2	2	2		1
I USUALLY UNDERSTAND MATH					
Yes	94	93	94		79*
No	6	7	6		10
				(Undecided	11)
TAKE MATH ONLY BECAUSE I HAVE TO					
Yes	32	31	33		29*
No	68	69	67		58
				(Undecided	13)
HOW HARD ARE MATH COURSES					
Easier than most	24	26	22		
About same as most	58	55	61		
Harder than most	18	19	17		
HOURS PER DAY OF TV					
Less than 1	8	8	8	6	
Between 1 and 2	25	25	24	17	
Between 2 and 3	29	28	29	25	
Between 3 and 4	22	21	23	27	
More than 4	16	17	16	25	
HOW MUCH DO YOU LIKE MATH					
Very much	29	30	28	29	
Somewhat	63	62	64	58	
Not at all	8	8	8	13	
HOW USEFUL IS MATH COMPARED TO OTHER SUBJECTS					
Very useful	55	58	52	52	
Somewhat useful	41	38	45	44	
Not very useful	4	4	3	4	

AEP-2 response categories have been combined: "Agree" and "Strongly agree" to "Yes"; "Disagree" and "Strongly Disagree" o "No"

AEP se categories have been combined: "Almost daily" and "A few times a week" to "Often"; "Less than once a eek :e a month" to "Sometimes".

TABLE 7

Responses of 17-Year-Olds to Questionnaire Items Reported in Percentages

Questionnaire Items	All	Sex		CAEP-1	NAEP-2
		M	F	1976-77	1977-78
MATH MORE FOR BOYS THAN GIRLS					
Yes	7	11	3		2**
No	70	60	80		91
Undecided	23	28	17		7
IMPORTANT TO KNOW MATH TO GET GOOD JOB					
Yes	92	94	90		
No	4	3	4		
Undecided	4	3	6		
I WOULD LIKE TO WORK AT JOB USING MATH					
Yes	34	40	28		
No	33	29	38		
Undecided	33	31	35		
MATH USEFUL SOLVING PROBLEMS IN EVERYDAY LIFE					
Yes	79	81	77		77**
No	8	8	9		11
Undecided	13	12	15		10
MATH IS BORING					
Yes	21	21	20		
No	35	38	32		
Sometimes	45	41	49		
MATH UPSETS ME					
Yes	10	9	11		
No	53	58	47		
Sometimes	38	33	42		
MATH MORE FOR GIRLS THAN BOYS					
Yes	2	4	[illegible]		3**
No	76	70	82		89
Undecided	21	26	17		8
HOW OFTEN USED HAND CALCULATOR					
Often	27	28	27		33**
Never	8	9	8		21
Sometimes	64	64	65		41
YOU OR FAMILY OWN HAND CALCULATOR					
Yes	93	94	91		86
No	6	5	8		13
I don't know	1	1	1		1
I USUALLY UNDERSTAND MATH					
Yes	83	87	80		67**
No	16	13	20		20
				(Undecided	14)
TOOK MATH ONLY BECAUSE I HAD TO					
Yes	34	31	36		26**
No	66	69	63		63
				(Undecided	11)
HOURS PER DAY OF TV					
Less than 1	23	24	23	22	
Between 1 and 2	34	35	33	30	
Between 2 and 3	24	24	24	23	
Between 3 and 4	13	12	14	15	
More than 4	6	5	6	11	
HOW MUCH DO YOU LIKE MATH					
Very much	20	21	18	21	
Somewhat	63	64	61	56	
Not at all	17	15	20	23	
HOW USEFUL IS MATH COMPARED TO OTHER SUBJECTS					
Very useful	43	50	37	35	
Somewhat useful	50	45	55	56	
Not very useful	7	6	8	9	
OF GRADES 9, 10, 11, HOW MANY YEARS OF MATH					
None	0.3	0.2	0.4	0.3	
1 year	2	2	3	7	
2 years	18	14	23	24	
3 years	79	84	73	69	
HOW HARD ARE MATH COURSES					
Easier than most courses	17	20	15		
About the same as most	47	46	48		
Harder than most	35	35	36		
WHICH STATEMENT BEST DESCRIBES YOUR FEELINGS					
Math is my favorite	5	6	4		
Math is one of my favorites	39	42	36		
Math is not one of my favorites	40	38	42		
Math is my least favorite	16	15	18		
HOURS PER WEEK EMPLOYED OUTSIDE OF SCHOOL					
None	29	25	33		
1 to 5	10	8	12		
6 to 10	10	11	10		
11 to 15	12	11	13		
16 to 20	17	17	18		
21 to 25	11	14	9		
More than 25	9	14	4		

**NALP-2 response categories have been combined.

Achievement on Total Test by Questionnaire Response Groups

Table 8 presents the achievement averages on the total test for various reporting groups at each age level.

Males and females scored essentially the same on the total test at the 9- and 13-year-old levels. Male 17-year-olds performed higher than females by six percentage points at 78% and 72% respectively.

Two items asked students if they felt that mathematics was more for one sex than the other. At each age level, those who said "yes" tended to score lower on the total test than did those who said "no" or were undecided.

The profiles were similar for three attitude items; the first asked students if they felt that math is boring, the second asked if they felt it upsets them, and the third asked how much they like math. The 9- and 13-year-olds who indicated a negative attitude tended to score from one to eleven percentage points below other students, while at the 17-year-old level, students who answered negatively scored from eleven to eighteen percentage points lower on the total test than other students.

The results for an item asking how often the student had used a hand calculator showed only small differences in total achievement among responses, with 13- and 17-year-olds who responded "never" scoring slightly lower than other students. At each age level, students who said that their family did not own a calculator tended to score approximately 10 percentage points lower than other students.

On a question concerning how many hours per day students watched television, those who reported watching less than two hours scored from 6 to 18 percentage points higher than those who reported watching more than four hours, with the smallest difference recorded for 9-year-olds and the largest for 17-year-olds.

Several questions were asked of 17-year-olds only. One such question concerned the number of years the student had studied math in grades 9, 10, or 11. Students reporting 3 years of math averaged 76% on achievement. Those with only one year of math averaged 57% on achievement. Another question asked how many hours per week students were employed outside of school. There was essentially no relationship between hours of employment and total test score, with all categories achieving at about the 73% level.

TABLE 8 (continued)

Questionnaire Items	Average Percentage of Items Answered Correctly on Total Test		
	9-Year-Olds	13-Year-Olds	17-Year-Olds
HOW USEFUL IS MATH COMPARED TO OTHER SUBJECTS			
Very useful	78	71	78
Somewhat useful	77	70	69
Not very useful	67	65	64
I WOULD LIKE TO WORK AT JOB USING MATH	NA	NA	
Yes			79
No			65
Undecided			74
OF GRADES 9, 10, 11, HOW MANY YEARS OF MATH	NA	NA	
None			57
1 year			57
2 years			62
3 years			76
WHICH STATEMENT BEST DESCRIBES YOUR FEELINGS	NA	NA	
Math is my favorite			78
Math is one of my favorite			78
Math is not one of my favorite			70
Math is my least favorite			64
HOURS PER WEEK EMPLOYED OUTSIDE OF SCHOOL	NA	NA	
None			71
1 to 5			74
6 to 10			75
11 to 15			74
16 to 20			74
21 to 25			72
More than 25			72

PART III: INTERPRETATIONS AND RECOMMENDATIONS

INTRODUCTION

Discussion

The Statewide Mathematics Advisory Committee (SMAC) has collaborated with personnel of the Connecticut State Department of Education and members of the Mathematics Education Center, School of Education, The University of Connecticut in interpreting the results of the assessment. The interpretations of results and the recommendations for mathematics education in Connecticut are presented in this section of the report.

In designing the mathematics tests and in considering the findings, SMAC recognized that there are certain limitations in any effort to assess achievement in mathematics. There are many more worthy goals and objectives than can reasonably be assessed by a paper and pencil test in a limited period of time. Hence, SMAC selected for assessment those mathematics objectives which the members considered to be of high priority. Also, for each objective there are unlimited possibilities for combinations of items which could be selected to assess the objective, ranging from very easy to extremely difficult. Items were selected which, in the professional opinion of Committee members, represented reasonable achievement expectations for a particular grade level.

The reader is reminded that the tests were different for each age/grade level even though the goal areas and some of the objectives have the same names.

In general, the task force was happy to see an increase in the performance of 9-year-olds in the CAEP-2 statewide sample as compared to the CAEP-1 sample. However, there was continued concern over the performance of 13-year-olds which showed a small decrease from CAEP-1 to CAEP-2. Seventeen-year-olds performed at about the same level on both assessments. Overall, the results indicated the need to continue to strengthen the mathematics program in Connecticut

General Recommendations

(1) Care should be exercised to maintain a balanced emphasis between "basic" computation and the other areas of the mathematics curriculum.

(2) The role of calculators in mathematics education should be subjected to research studies.

(3) The amount of time in minutes per week assigned to the teaching of mathematics in grades K-8 should be increased.

GOAL AREA 1: MATHEMATICAL CONCEPTS

Discussion

Both 9-year-olds and 17-year-olds performed at about the same level for this goal area as their average performances for all goal areas. However, of all goal areas for 13-year-olds, this one showed the lowest score at 61%. Two items on the test for 13-year-olds were chiefly responsible for the relatively low average score in this goal area. Only 24% of 13-year-olds correctly identified a fraction falling between 1/4 and 3/8 (Item #56) and only 44% correctly gave the percent equivalent to the fraction 1/5 (Item #32).

These performances represent a drop from the level of performance of 13-year-olds in CAEP-1 who scored 32% and 55% respectively on the same two items. CAEP-2 17-year-olds on the same items scored somewhat higher at 52% and 62% respectively. On a new item which asked which of four fractions is least, 13-year-olds scored 54% (Item #57), and 17-year-olds scored 75% (Item #58).

Thirteen-year-olds scored 53% on an item asking which of four decimals represents the greatest number (Item #62), and on the same item, 17-year-olds scored 72% (Item #66).

On shared items in Goal Area 1, the average level of performance for CAEP-2 had remained about the same as the CAEP-1 performances for 9- and 17-year-olds, and had decreased slightly at the 13-year-old level.

Recommendations

(1) At all grade levels, there should be increased emphasis on understanding relationships between fractions and decimals. Of particular practical importance in the age of the calculator is the technique of converting from fraction notation to decimal notation.

(2) The emphasis on ordering and place value in the early grades should continue, and increased emphasis should be given to ordering of fractions and decimals in later grades. The recommendation from CAEP-1 for more emphasis on the concepts of "less than" and "more than" is reinforced.

(3) Recommendations from CAEP-1 concerning fractional concepts are reiterated. In grades one through four there should be emphasis on the meaning of fractions. Students in the third and fourth grades should be matching equivalent fractions and models of equivalent fractions should be used as aids in grades three through eight.

(4) There should be emphasis given to the concept of percent, with particular attention to the relationship between percents and proportions in grades 7 and 8.

(5) The mathematics curriculum at all grade levels should include increased opportunities for students to experience mathematical concepts and to develop a stronger intuitive sense of number.

GOAL AREA 2: COMPUTATION

Discussion

At each age level, the average score for the Computation goal area was among the highest for all goal areas. Nine-year-olds had an overall average of 82%; on items shared with CAEP-1, the performance level for CAEP-2 at 81% was higher than the CAEP-1 level of 75%. The 13-year-olds' overall average on computation was 75%, and the overall average for 17-year-olds was 80%. Both 13- and 17-year-olds matched the CAEP-1 performance levels on shared items.

The performances of CAEP-2 9-year-olds on three items represented sizeable gains as compared to CAEP-1 performances on the same items. On an item involving subtraction of whole numbers (Item #7), the CAEP-2 performance was at the 60% level as compared to 51% for CAEP-1. An item requiring the addition of four dollar-and-cents figures (Item #10) resulted in a score of 55% for CAEP-2 and 48% for CAEP-1. For a whole number multiplication item (Item #13), the results were 77% for CAEP-2 and 68% for CAEP-1.

In order to get some base-line data on an objective concerning the ability of 9-year-olds to divide whole numbers with one digit divisors, four such items were included on the CAEP-2 tests (#'s 6, 14, 15, 18). The CAEP-1 test did not include such items. The range of scores for these items was 77% to 89%.

Both 13- and 17-year-olds achieved well on whole number items. However, there is still some room for improvement in computation items where zero is involved. For the item, 671 x 402, the achievement level for 13-year-olds was 75% and for 17-year-olds it was 83%. While these performances were a bit better than the corresponding NAEP-2 national performances on the same item (72% and 79%) it is reasonable to expect higher scores by Connecticut students. The CAEP-1 item, 714 ÷ 7, was repeated on the CAEP-2 test for both 13- and 17-year-olds and results were slightly higher than those for CAEP-1. For 13-year-olds, the CAEP-2, CAEP-1 scores were 80%, 74%; for 17-year-olds the scores were 76%, 77%. Once again, the incorrect choice, 12, was fairly common and seemed to highlight the importance of estimating the reasonableness of an answer. Another division item which required a zero in the answer was the NAEP-2 item, 3052 ÷ 28, used at the 17-year-old level where 72% of Connecticut students answered it correctly. This was a respectable level for an item as difficult as this, particularly when compared to the NAEP-2 national results of 52% answering correctly.

The CAEP-2 results for both 13- and 17-year-olds in adding and subtracting decimals were essentially the same as the CAEP-1 results.

Both 13- and 17-year-olds performed reasonably well on multiplication and division of decimals. However, just as with CAEP-1, there was evidence of difficulties with decimal placement. The lowest performance was by 13-year-olds on a decimal-by-decimal division item (#17, 67%), an item type not used on CAEP-1. On the same item, 17-year-olds were higher with 77% answering correctly.

For the objective dealing with addition and subtraction of fractions and mixed numbers (Objective #2.5), at both the 13- and 17-year-old levels there were three items shared by CAEP-1 and CAEP-2; the results were relatively low compared to other computation items and essentially the same both times. The averages of the three items for 13-year-olds were 64% for CAEP-2 and 66% for CAEP-1. The averages of the three items for 17-year-olds were 68% for CAEP-2 and 69% for CAEP-1. On items common to both age levels, 17-year-olds scored from 13 to 16 percentage points higher than 13-year-olds, an encouraging result. Just as with CAEP-1, the CAEP-2 difficulty appears to be mainly with finding lowest common denominators.

The CAEP-2 results for both 13- and 17-year-olds (71% average for both age groups) for multiplication and division of fractions and mixed numbers were essentially the same as the CAEP-1 results (73% for 13-year-olds and 68% for 17-year-olds) on shared items. For CAEP-2, two division items were included at the 13-year-old level (CAEP-1 did not test 13-year-olds on division with fractions); the results were somewhat low at 55% and 59%.

A new objective on the ability to use percent (Objective 2.7) was included on the CAEP-2 tests at both the 13- and 17-year-old levels. The results were somewhat low on two NAEP-2 items used with both age levels. On the item, "30 is what percent of 60", 43% of 13-year-olds and 61% of 17-year-olds answered correctly. Each age level performed only as well as the corresponding NAEP-2 national sample. A very low performance was shown on the item, what is 4% of 75? Only 23% of 13-year-olds and 46% of 17-year-olds answered correctly. The improvement from the younger to the older level should be noted. The performances by Connecticut students were almost twice as high as their respective NAEP-2 national counterparts.

Overall, the CAEP-1/CAEP-2 comparison indicated that Connecticut students generally have shown some small improvements in computation skills and have not lost ground in other areas of the curriculum.

Recommendations

(1) More emphasis should be given to whole number computations where zero is involved in either the problem or in the answer.

(2) Extra consideration should be given to the correct placement of the decimal point in multiplication and division problems.

(3) Emphasis at all grade levels should be given to estimating answers and to considering the reasonableness of solutions. This is of particular importance as the use of calculators becomes more commonplace.

(4) Beginning in grade seven and continuing in higher grade levels, more emphasis should be given to computations involving the use of percent.

GOAL AREA 3: MEASUREMENT

Discussion

The results in the Measurement goal area were quite varied from one age group to another. The 9-year-olds' performance in this goal area was a bit higher than their average for the total test, the 13-year-olds' performance was seven percentage points below their total test average, and the 17-year-olds' average for the goal area was essentially the same as their total test average.

For the most part, 9-year-olds repeated the comparatively high level of performance of their CAEP-1 counterparts on the shared items of the Measurement goal area (11 out of 14 were shared items). However, the students demonstrated a poor performance on two metric measure items. Only 44% of the 9-year-olds answered correctly that one meter equals 100 centimeters and only 49% identified the kilometer as the best metric measure for the distance between cities as contrasted with 95% who identified the mile as the best U.S. measure for the distance between New York and Boston.

The performance of 13-year-olds was quite variable on items dealing with measurement. They did reasonably well on the perimeter of a triangle (79% level) and somewhat less well on the perimeter of a rectangle (56% level).

The greatest variability in the performance of 13-year-olds came in Objective 3.3 (metric). While 79% correctly identified the liter as the best unit for the measure of a gasoline tank and 69% correctly identified the kilometer as the best unit for the distance between cities, only 39% were correct in converting eight kilograms to grams and only 49% were correct in converting 357 centimeters to meters. Seventeen-year-olds performed only slightly higher on these last two items (45% and 53% respectively).

The CAEP-2 tests for 13-year-olds and 17-year-olds included the same three CAEP-1 items on converting U.S. units of measure to equivalent units of measure. On an item requiring the conversion of 1 1/2 pounds to ounces, the CAEP-2 performance by 13-year-olds at 50% was 8 percentage points lower than the CAEP-1 performance. On the same item, the 17-year-olds scored 73% on CAEP-2 and 74% on CAEP-1. An item requiring the conversion of 30 inches into feet and inches resulted in a difference of 8 percentage points between CAEP-2 and CAEP-1 at the 13-year-old level, with the CAEP-2 score of 78% the lower of the two. The performances of 17-year-olds on the item was high for both CAEP-2 and CAEP-1, with CAEP-2 again the lower at 88% to 92%. On an item requiring the conversion of 8 quarts into gallons, the results for 13-year-olds were lower on CAEP-2 than on CAEP-1 by 9 percentage points, 67% to 76%. The results for 17-year-olds were better, but still favored CAEP-1, 79% to 84%. The differences seem to be evidence that there has been some deemphasis in recent years on work with U.S. units of measure in anticipation of increased importance of metric units.

Recommendations

(1) More attention should be given to perimeter and area problems, beginning in fourth grade.

(2) Work with U.S. units of measure should continue (particularly in the upper grade levels) until it is obvious that the conversion to metric units has become widespread in everyday applications.

(3) At all levels, multiplying and dividing by multiples of 10 should be given special attention to provide a strong background for working within the metric system.

(4) More emphasis should be given to metric terminology and to converting to equivalent units within the metric system.

(5) The teaching of measurement should be encouraged in applied areas such as home economics, shop, and science as well as in mathematics.

GOAL AREA 4: TABLES AND GRAPHS

Discussion

The Tables and Graphs goal area produced mixed levels of results across the age levels. This was the lowest of all goal areas for 9-year-olds at 63%, a middle goal area for 13-year-olds at 73%, and the highest goal area for 17-year-olds at 82%.

Nine-year-olds in CAEP-2 matched the satisfactory performance of their CAEP-1 counterparts on two bar graph items for which the respective averages were 81% and 83%. However, only 47% were able to read correctly a table of sock sizes matched with shoe sizes. On an item in which they were required to identify the bar graph depicting certain given data (Item #60), 42% were correct. While low, this result compares favorably with the NAEP-2 national results of 32%.

In interpreting data from tables and graphs, both 13- and 17-year-olds performed at levels which the committee considered to be reasonably high for the age/grade level, with the exception of a NAEP-2 item used at both age levels (Item #60 for 13-year-olds, Item #51 for 17-year-olds). The item required reading and interpreting a circle graph; Connecticut 13-year-olds performed at a lower level than the NAEP-2 national sample at 55% to 64%, and 17-year-olds were lower than the NAEP-2 sample at 66% to 70%.

Recommendations

(1) Continued attention should be given to reading and interpreting tables and graphs, particularly the use of tables and graphs in problem solving situations.

GOAL AREA 5: APPLICATIONS/PROBLEMS

Discussion

The performance at all three age levels on problems was low. Nine-, 13-, and 17-year-olds on the average for the goal area scored 68%, 66%, and 70% respectively.

CAEP-2, 9-year-olds achieved at a higher level than their counterparts on each item shared with CAEP-1. On an item concerning the change from $5.00 for a $1.40 purchase, the CAEP-2 score was 57%, and the CAEP-1 score was 18 points lower at 39%. Both CAEP-2 and CAEP-1 had high scores on an item about the cost of 7 books at $2.00 each, with the CAEP-2 score just one point higher at 86%.

At the 13-year-old level, the CAEP-2 scores were at about the same level or a bit below the CAEP-1 scores on shared items. Both groups scored high on an item about a rocket directed at a target 525 miles south which landed 624 miles south; the open-ended question asked by how many miles it missed its target. The CAEP-2 result was 82%, and the CAEP-1 result was 81%. On an item dealing with discounts on a TV set of 10% and 15%, the CAEP-2 score was 5 points lower than the CAEP-1 score, 56% to 61%.

For 17-year-olds, the results on shared items were about the same for CAEP-2 and CAEP-1. On an item asking the 6% tax on a $200 TV set, the CAEP-2 score of 83% was 3 points higher than the CAEP-1 score.

Connecticut 9-year-olds outscored their national counterparts on each of the four items shared with NAEP-2. The largest differences was in an item asking about the cost of three items from a menu. The CAEP-2 score was 88% as compared to the NAEP national score of 63%. On an item asking how much more a $5.25 book costs than a $2.75 airplane, the CAEP-2 score was somewhat low at 54%, but the NAEP-2 score was even lower at 46%.

At both the 13-, and 17-year-old levels, the CAEP-2 results were about the same as the NAEP-2 results. The 13-year-olds scored low (44% for CAEP-2 and 35% for NAEP-2) on an item which asks how many feet of fencing Mr. Jones needs for his 10 by 6 rectangular garden. The 17-year-olds' performances were low on an item dealing with the amount of each installment in the purchase of an automobile; the CAEP-2 score was 41% and the NAEP-2 score was lower at 35%.

The evidence supports the opinion that students are not getting sufficient practice in handling practical, real-world problems.

Recommendations

(1) Problem-solving is of highest priority and as such should be an integral part of all math activities, not simply an isolated topic. Basic skills and concepts should be integrated with problems that strengthen computational skills and give relevance to the material being studied.

(2) Techniques of problem-solving should be stressed even for good readers. Teachers should stress the importance of analyzing a problem and devising a plan for its solution. They should provide frequent practice in identifying the unknown quantity, selecting useful pertinent information, choosing a procedure for solution as well as estimating the reasonableness of an answer, and checking for accuracy of computation.

(3) Every effort should be made to keep problems relevant to the experiences and needs of students.

(4) Mathematics teachers should work with teachers in other curriculum areas to help reinforce problem skills.

(5) The use of calculators is recommended beginning in grade 7 to allow students to do the computation part of problems more rapidly and hence to allow them more time to do more problems.

(6) Teachers are encouraged to use the technique of "a problem a day."

(7) Problem sets should contain a variety of problems requiring various arithmetic operations for solutions.

GOAL AREA 6: GEOMETRY

Discussion

For 9-year-olds, the geometry goal area required students to identify and name geometric figures, a task with they were able to do quite successfully. The results were highest (97%) for an item (#31) asking students to identify a square, and somewhat lower but still good for an item (#52) on identifying a rectangle (80%) and an item (#59) on identifying a triangle (82%). Geometry was not a goal area for CAEP-1, 9-year-olds.

The geometry goal area for 13-year-olds produced mixed results. Students performed well on identifying parallel lines (Item #53, 91%) and on identifying the diagonal of a rectangle (Item #61, 91%). On an item (#69) requiring students to identify the radius of a circle, 68% answered correctly in CAEP-2, while 64% of their counterparts in NAEP-2 answered correctly. The lowest performance level was 52% on identifying an equilateral triangle (Item #64); the corresponding NAEP-2 results were even lower at 47% answering correctly.

Geometry for 17-year-olds dealt with a wide variety of geometric concepts and produced a wide variety of results. These students were strongest on identifying the angle formed by the hands of a clock (75%) and on visualizing the number of blocks required to fill a certain crate (72%). They were reasonably successful with an item (#63) requiring some notion of similar triangles on which 60% of the students in CAEP-2 answered correctly as compared to 52% of their NAEP-2 counterparts. The CAEP-2 score was the same (32%) as the CAEP-1 score on an item (#59) requiring that students estimate the circumference of a circle given the diameter.

Recommendations

(1) Geometry should continue to be a part of the curriculum for the elementary grades.

(2) Emphasis should be given to evidence of geometric concepts and models as they occur in the world around students.

(3) More emphasis should be given to informal and intuitive treatments of certain geometric concepts and facts for the middle grades and for all high school students whether or not they take a full course in geometry.

APPENDEX A

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APPENDIX B

MATHEMATICS ITEM PERFORMANCE BY VARIOUS GROUPS

This appendix consists of Tables A-1, A-2, and A-3 containing data for 9-, 13-, and 17-year-olds, respectively. For each individual mathematics item on each test, the tables provide the percentage of students answering correctly in each of these categories: all students minus those in Big Cities, all students in the sample, students by sex, region, and size of community. Also, CAEP-1 results or NAEP-2 results are given where applicable.

TABLE A.1

Individual Mathematics Item Performance by CAEP-2 9-Year-Olds by Sex, Region, Size of Community with CAEP-1 or NAEP-2 Results Where Applicable

Item Number	Description of Item	Percentage of Students Answering Correctly															
		Connecticut															Nation
		State Minus Big Cities	All	Sex		Region**						Size of Community				CAEP-1	NAEP-2
				M	F	1	2	3	4	5	6	1	2	3	4	1976-77	1977-78
1	826 + 786 =	94	93	92	93	92	96	92	93	95	94	87	94	94	93	87	
2	659 - 207 =	93	92	91	93	91	91	94	94	91	94	87	94	92	92	88	
3	$63 x 3 =	92	92	92	91	91	92	93	91	94	95	88	93	92	92	89	
4	$4.76 - 0.38 =	86	83	81	86	84	86	85	84	89	87	71	85	86	86		
5	725 + 203 =	97	97	96	97	95	96	98	97	99	98	93	98	97	97	93	
6	45 ÷ 5 =	90	89	88	90	85	93	95	84	90	92	82	90	90	90		
7*	1054 - 865 =	63	60	58	62	59	67	64	62	62	61	45	64	62	62	51	
8	43 + 71 + 75 + 92 =	83	81	80	83	80	83	85	80	83	83	73	82	84	82		59
9*	48 x 4 =	80	77	75	79	76	84	85	71	80	79	63	79	77	83		48
10*	$3.06 + 10.00 + 9.14 + 5.10 =	57	55	54	57	55	65	58	56	54	51	46	60	56	56	48	
11	37 + 18 =	92	91	88	94	90	92	93	91	95	94	85	92	92	93		82
12*	36 - 19 =	82	80	77	84	81	84	84	79	85	78	69	83	84	82	77	
13	402 x 7 =	78	77	75	78	75	80	82	71	78	77	71	77	78	78	68	
14	$46 ÷ 2 =	79	78	77	78	80	81	82	75	79	76	69	80	77	80		
15	36¢ ÷ 3 =	85	84	84	85	84	89	88	81	85	80	79	85	86	85		
16	861 - 583 =	85	83	82	85	83	87	87	84	84	80	73	87	84	85	75	
17	315 x 5 =	90	89	88	90	86	89	93	86	92	89	83	91	88	90		
18	84 ÷ 4 =	79	77	76	78	72	81	83	75	78	78	69	78	77	80		
19*	12, 17, 22, ___, 32	89	86	84	87	85	91	91	86	88	89	70	87	88	90		
20*	Fractional part of rectangle shaded	56	52	51	53	60	64	57	53	50	47	32	64	44	59		23
21*	Paul has 21 stamps. How many will he have after buying 54 more	91	90	90	89	93	93	90	93	90	91	81	92	90	92		85
22*	How much more a $5.25 book costs than a $2.75 airplane	58	54	49	59	56	63	61	55	56	58	33	59	56	60		46
23*	At 2 biscuits per day, how long for dog to eat 24 biscuits	55	53	56	50	55	61	55	52	55	53	39	60	52	55	37	
24	How much for 7 books at $2.00 each	88	86	85	86	85	90	90	87	86	84	74	90	87	87	85	
25	Change from $5 for a $1.40 purchase	60	57	52	61	56	64	64	62	52	56	40	64	59	59	39	
26	Total cost of 3 items on a menu	90	88	86	91	90	92	90	88	90	92	80	90	89	91		63
27	Amount of food 5 rabbits eat in one week at rate of 2 lbs. per week for one rabbit	57	54	57	51	56	65	58	52	52	53	38	60	52	58		51
28	At rate of 5 min. per window, how to figure time for 10 windows	69	66	66	65	64	78	71	65	67	65	48	74	68	67	61	

29	Fractional part of rectangle shaded	69	65	65	66	72	76	73	63	63	62	46	74	61	71	61	
30	762 is equal to which sum	82	79	80	79	75	88	83	82	79	81	63	82	81	83	81	
31	Which figure is a square	98	97	96	97	96	98	99	98	99	97	89	98	98	98		
32	Which number is least (whole)	86	84	83	85	82	88	86	84	85	89	76	84	85	87	83	
33	Time on clock (10 to 4)	79	76	76	77	77	79	81	79	75	76	64	77	80	79	76	
34	A quarter equals how many nickels	95	94	94	93	95	97	96	94	94	92	86	95	95	95	92	
35	Best measure of toothbrush (inch)	81	79	78	80	80	84	85	76	79	73	72	83	80	79	87	
36	In which number does 7 stand for 7 thousand	80	78	81	76	77	85	85	78	74	79	68	81	81	80	78	
37	2 quarters, 1 dime, 3 nickels is how much	86	84	83	84	83	86	89	88	81	87	72	87	85	87		74
38	Number 10 more than 4375	62	59	61	57	57	65	65	58	63	59	39	62	60	64	59	
39	Fraction of dots colored in	78	74	73	75	78	81	81	75	73	72	56	80	72	80	73	
40	Time on clock (6:25)	89	87	89	85	90	93	90	86	89	84	76	87	89	90	83	
41	One meter equals how many centimeters	46	44	45	44	47	43	52	42	42	44	35	52	44	43		
42	In 3654 the 4 means	88	83	83	84	85	90	90	87	87	86	59	86	87	90	80	
43	Best measure NY to Boston (mile)	96	95	95	94	96	97	97	95	95	96	86	95	96	97	95	
44	Bar graph - who weighs most	97	95	95	96	97	97	97	96	96	97	88	96	98	96	96	
45	Bar graph - who weighs closest to 50 pounds	70	67	69	65	69	70	74	65	73	69	48	68	70	73	70	
46	Tens place digit in 2079	80	76	75	76	76	82	82	79	79	79	52	77	80	82		63
47	Time two hours ago	75	71	73	69	73	79	75	73	74	74	48	73	76	75	68	
48	Read a table of sock sizes	49	47	43	50	43	55	56	42	47	47	33	52	46	50		
49	Length of nail to nearest centimeter	93	91	91	92	90	94	95	93	91	95	80	94	91	95	92	
50	A dollar equals how many quarters	93	91	92	90	90	95	96	93	92	91	80	93	94	94	87	
51	Best measure of distance between cities (kilometer)	52	49	57	42	52	59	54	47	50	40	35	58	48	50		
52	Which is a rectangle	82	80	79	80	78	80	87	83	79	79	68	84	80	82		
53	The sum of three hundreds, eight tens, and four ones	83	79	81	78	77	88	87	82	80	76	58	85	81	84	78	
54	Time in one-half hour	92	89	89	88	90	93	92	93	89	92	72	91	91	92	89	
55	Fractional part of circle shaded	74	71	70	72	76	79	78	69	70	69	53	77	67	77	72	
56	Which number is greatest (whole)	73	69	69	70	72	79	76	68	70	69	50	73	71	74	65	
57	Twenty pennies equals how many nickels	83	80	80	80	79	84	86	81	80	81	64	82	81	84	79	
58	Length of pencil to nearest inch	95	92	92	92	93	95	96	95	93	97	78	94	92	97	93	
59	Identify a figure as a triangle	85	82	81	82	84	84	90	85	83	80	63	87	82	87		
60	Which bar graph presents 6 given ages	45	42	41	43	37	52	47	36	46	47	27	50	36	47		32

*Open-ended item
**Regions do not include Big Cities

60 C8

TABLE A.2

Individual Mathematics Item Performance by CAEP-2 13-Year-Olds by Sex, Region, Size of Community with CAEP-1 or NAEP-2 Results Where Applicable

Item Number	Description of Item	Percentage of Students Answering Correctly																	
		Connecticut																	Nation
		State Minus Big Cities	All	Sex		Region**						Size of Community				CAEP-1			NAEP-2
				M	F	1	2	3	4	5	6	1	2	3	4	1976-77			1977-78
1	826 + 786 =	96	96	96	96	97	96	97	97	97	95	95	96	97	97	97			
2	609 x 73 =	96	94	93	95	96	96	95	95	97	94	84	96	95	96	91			
3	714 ÷ 7 =	82	80	80	80	85	82	85	78	80	77	71	80	82	83	74			
4	425 x 0.33 =	90	88	87	89	90	93	93	87	88	89	73	91	88	91	86			
5	2 3/8 + 3 7/8 =	68	64	62	66	70	71	69	68	67	60	38	74	58	71	64			
6	5/6 - 1/3 =	55	51	49	52	53	67	54	53	51	38	28	58	46	58	53			
7*	1054 - 865 =	89	88	87	89	88	89	91	87	91	91	80	89	88	90	87			
8*	43 + 71 + 75 + 92 =	92	92	90	93	94	91	93	92	91	95	88	92	91	93				87
9*	1/2 + 1/3 =	55	52	50	54	53	68	53	52	52	42	34	59	48	57				40
10*	30 is what % of 60?	47	43	51	36	46	55	52	34	47	40	20	47	41	51				42
11*	36 - 19 =	95	94	94	94	94	95	95	95	93	95	90	95	93	95	93			
12*	7.54 + 1.52 =	86	84	82	87	87	88	85	85	85	80	77	88	83	86				78
13*	If 23.8 subtracted from 62.1	77	74	72	77	76	80	78	74	78	75	58	81	72	77	72			
14	2/3 x 3/4 =	81	78	75	81	83	84	80	79	83	75	63	84	75	83	79			
15	$10.00 - 1.98 =	92	91	91	90	92	91	92	93	92	93	84	92	91	92	85			
16	1.29 x 0.06 =	72	71	67	74	70	75	73	70	76	66	62	72	71	73				
17	1.96 ÷ 0.04 =	70	67	65	68	72	77	72	65	68	61	46	70	70	71				
18	4 1/2 x 3 =	72	68	68	68	75	77	74	68	71	57	45	73	66	74	68			
19	339 ÷ 22 =	92	90	88	92	91	92	93	94	90	90	80	94	89	92	84			
20*	671 x 402 =	76	75	72	77	81	76	76	76	74	77	64	79	72	77				72
21*	What fractional part of rectangle shaded?	92	90	89	91	88	94	92	92	96	88	78	93	92	92				87
22*	$7.05 ÷ 3 =	85	83	80	85	87	86	88	83	85	80	66	86	85	85				
23*	48 x 4 =	94	93	93	94	93	94	94	95	93	96	90	93	93	95				
24*	125 ÷ 5 =	96	95	95	95	97	97	96	96	95	96	88	97	96	96	94			
25*	What is 4% of 75?	25	23	24	22	26	30	25	23	24	17	12	26	21	27				11
26	4 1/2 - 2 1/4 =	80	78	75	80	81	85	80	78	83	69	64	83	77	81	80			
27	What is 25% of 80?	73	71	75	68	74	79	74	64	75	74	60	73	69	76				
28	4.2 x 0.3 =	78	74	71	77	76	84	81	75	75	65	55	78	76	79	70			
29	4 ÷ 1/2 =	58	55	55	55	60	64	56	55	58	52	36	63	46	62				
30	3/8 x 2 =	70	68	66	70	70	75	70	66	73	66	54	73	62	74	73			
31	3/4 ÷ 3 =	61	59	55	63	63	66	58	57	61	57	49	61	55	64				
32*	1/5 is equal to what %?	47	44	47	40	45	53	53	38	47	39	23	46	40	52	55			
33*	1 1/2 lbs. = ___ ounces	53	50	56	45	50	56	56	50	58	44	31	53	46	58	58			
34*	$3.06 + 10.00 + 9.14 + + 5.10 =	89	87	85	89	88	89	90	86	91	83	79	89	87	89	88			
35*	Rocket directed at target. By how many miles did it miss?	86	82	82	83	88	88	87	83	85	82	62	88	81	87	81			
36*	To job at 7:45 a.m., returned home 10 hours later at what time?	75	72	75	69	74	78	75	71	79	68	54	76	70	77	80			
37*	TV sets on sale with 10% & 15% discount. What is difference in sale prices?	59	56	60	53	58	63	62	54	60	53	40	63	53	61	61			
38	What is 6% sales tax on $200 TV set?	62	60	64	56	60	64	67	59	65	54	48	64	60	63	60			

39	Mr. J. fenced his 10 by 6 feet rectangular garden. How much fencing used?	48	44	52	36	49	52	48	44	49	40	21	47	45	49		35
40	What is average of Marie's 3 spelling test scores?	80	76	76	77	82	82	80	79	79	72	56	82	74	82		
41	J. received 120 votes, M. received 80. What % of total did J. receive?	37	34	39	30	33	45	39	33	36	28	19	37	34	39		
42	At 10 m.p.h. how far will Kate travel in 5 hours?	88	86	87	85	85	90	90	87	88	85	73	87	86	90		91
43	Rope cut into 2 lengths. How long before cutting?	54	51	56	47	52	55	56	54	56	47	37	57	48	56		
44	Cost of 3 items from given menu	95	94	93	95	96	95	96	94	93	94	91	94	95	95		95
45	37% of population under 20, what % is 20 or older?	78	74	79	70	77	81	81	73	79	72	49	77	72	83		77
46	Best measure for gasoline tank (liter)	83	79	83	75	81	86	84	78	88	77	56	86	78	85		
47	Perimeter of given 10 by 6 rectangle	59	56	60	51	56	65	58	59	61	53	34	60	57	60		53
48	0.009 equals what fraction?	75	72	72	73	75	79	77	69	73	69	59	75	73	75	70	
49	Area of given 6 by 2 rectangle	55	51	50	51	45	61	61	51	57	40	28	58	47	58	56	
50	30 in. = ___ft. ___in.	83	78	83	74	81	84	83	79	86	82	52	83	76	87	86	
51	Which number is greatest? (Whole numbers)	84	82	82	83	84	86	84	82	84	85	69	86	82	85		
52	8 quarts = ___gallons	70	67	72	63	71	72	72	66	75	60	51	72	65	72		
53	Identify parallel lines	93	91	91	91	93	95	95	93	94	85	75	93	93	93	76	
54	Read size table for socks	85	83	80	85	85	85	85	86	85	82	68	84	82	88	94	
55	Identify one and twenty-twenty-four hundreths	73	70	70	70	71	78	76	65	73	69	53	70	70	77	88	73
56	Order fractions, 1/4, ___, 3/8	26	24	28	20	21	33	27	21	26	21	15	24	24	28	32	
57	Which fraction is least?	53	54	57	51	53	63	61	51	62	51	31	59	52	61		
58	Eight kilograms equal how many grams?	42	39	45	34	40	47	41	40	48	25	27	42	40	42		
59	Best measure between two cities (kilometer)	73	69	76	63	73	80	76	69	73	61	43	74	70	76	73	
60	Read a circle graph	58	55	57	54	56	63	56	56	61	51	40	59	53	60		64
61	Identify diagonal of a rectangle	93	91	91	92	92	94	92	92	96	88	82	92	92	94		
62	Which number is greatest? (Decimals)	57	53	57	49	53	64	60	53	57	48	27	61	51	59		54
63	Smallest unit? (Milligram)	72	67	68	65	70	80	72	66	77	53	38	69	72	73	68	
64	Identify an equilateral triangle	54	52	53	51	50	58	56	52	58	45	38	56	51	56		47
65	357 centimeters equal how many meters	51	49	52	45	53	61	52	43	52	36	34	53	50	50		
66	Read unemployment graph	75	71	72	71	77	78	75	73	78	64	50	79	67	77		
67	140 min. = ___hrs. ___min.	82	79	81	77	81	84	82	78	88	77	61	81	79	84		
68	Perimeter of triangle	82	79	79	79	79	86	83	79	85	74	63	82	79	84	82	
69	Identify a radius of a circle	71	68	69	68	75	73	73	65	73	66	51	70	69	74		64
70	Read a chart with symbol for kind of unit	88	84	84	84	86	87	89	87	92	85	62	88	83	91		

*Open-ended item
**Regions do not include Big Cities

TABLE A.3

Individual Mathematics Item Performance by CAEP-2 17-Year-Olds by Sex, Region, Size of Community with CAEP-1 or NAEP-2 Results Where Applicable

Item Number	Description of Item	Percentage of Students Answering Correctly																
		Connecticut																Nation
		State Minus Big Cities	All	Sex		Region**						Size of Community				CAEP-1		NAEP-2
				M	F	1	2	3	4	5	6	1	2	3	4	1976-77		1977-78
1	826 + 786 =	97	96	96	97	96	97	98	97	95	98	94	97	98	96	95		
2	609 x 73 =	93	93	93	93	92	95	95	91	94	91	91	94	91	94	95		
3	714 ÷ 7 =	77	76	77	74	79	81	79	75	73	76	67	78	77	77	77		
4	425 x 0.33 =	95	94	93	94	96	95	95	93	95	95	86	94	95	95	88		
5	2 3/8 + 3 7/8 =	80	77	80	74	79	85	82	76	78	77	63	79	79	81	76		
6	5/6 - 1/3 =	68	65	67	63	67	79	72	61	66	59	45	69	65	70	66		
7*	1054 - 865 =	93	92	91	92	96	93	92	91	92	94	85	91	93	94	92		
8*	43 + 71 + 75 + 92 =	95	94	94	95	94	94	95	97	92	95	92	94	94	95			92
9*	1/2 + 1/3 =	72	68	69	66	76	83	73	64	69	60	46	72	69	73			70
10*	30 is what % of 60	64	61	71	51	71	69	65	59	61	60	42	64	63	65			63
11*	36 - 19 =	94	94	93	95	96	93	94	94	94	93	92	94	94	94	95		
12*	7.54 + 1.52 =	92	92	92	93	93	91	92	92	95	91	91	92	90	94			90
13*	If 23.8 subtracted from 62.1	85	85	85	84	85	90	88	82	83	80	82	85	84	86	84		
14	2/3 x 3/4 =	88	86	84	88	88	91	89	84	88	83	75	90	84	88			
15	$10.00 - 1.98 =	93	93	92	93	93	96	95	93	90	91	88	95	91	93	90		
16	1.29 x 0.06 =	82	81	80	82	78	82	85	79	83	81	75	82	80	83			
17	1.96 ÷ 0.04 =	78	77	78	75	78	84	80	77	76	75	66	81	79	77	71		
18	4 1/2 x 3 =	79	77	82	72	84	83	78	75	79	78	63	79	76	82	80		
19	3 ÷ 3/4 =	71	69	69	70	71	80	74	65	67	68	58	74	69	70	58		
20*	671 x 402 =	84	83	83	84	82	86	83	84	85	80	82	83	82	85			79
21*	1826 ÷ 22 =	90	89	88	90	90	92	90	90	89	87	84	89	88	91			
22*	3052 ÷ 28 =	73	72	71	73	75	75	75	71	73	70	64	76	72	73			52
23*	What is 4% of 75	49	46	51	41	53	57	52	40	49	44	27	49	46	51			28
24*	1/5 is equal to what %	65	62	68	56	69	76	61	60	61	64	46	66	59	67	63		
25*	1 1/2 lbs. = ___ ounces	76	73	81	65	75	77	75	77	76	74	58	74	73	78	74		
26*	$3.06 + 10.00 + 9.14 + 5.10=	94	93	93	93	92	95	93	92	95	94	91	94	93	94	94		
27	74 x 38 =	92	91	90	92	93	94	92	89	92	90	88	93	88	93	89		
28	150% of 8 is ___	75	71	77	65	75	81	77	68	72	70	51	75	70	77			
29	4 1/4 - 2 1/2 =	65	61	67	56	66	73	65	59	65	61	41	63	63	67	64		
30	$74.46 ÷ 17 =	91	90	90	90	92	92	92	90	89	90	85	91	87	93	88		
31	3/8 ÷ 2 =	69	67	68	66	73	80	68	62	67	66	56	68	69	70	66		
32	Which set of fractions describes shaded part of rectangle	86	86	85	86	85	86	89	86	87	84	80	87	84	88	86		
33*	Angle formed by clock hands at 3 o'clock	77	75	81	69	82	82	76	72	78	75	60	77	73	80	72		
34*	Average of three summer incomes	75	71	75	68	77	81	77	68	74	71	50	74	71	78	72		
35*	To job at 7:45a.m. returned home 10 hrs. later at what time	89	88	89	86	90	91	89	86	88	87	81	88	87	90	87		
36*	Parking lot with graduated charges. How much from 10:45a.m. to 3:05p.m.	59	56	58	54	59	66	61	53	55	56	43	61	53	61	54		
37*	300 calories in nine ounces, how many in three ounces	76	73	80	67	77	80	77	71	76	78	56	75	71	80	79		

38*	Jerry bought a Ford, $200 down, 10% charge on balance. How much each of 10 paym'ts	44	41	46	36	42	48	48	39	43	41	22	41	41	47		35
39	What is 6% sales tax on $200 TV set	84	83	84	82	84	85	87	81	84	83	75	82	85	85	80	
40	Mr. J. fenced his 10 by 6 feet rectangular garden. How much fencing used	65	62	69	55	70	72	65	59	65	61	45	61	64	69		
41	Gallon of paint covers 250 sq. ft. How many gallons for 48 by 10	72	68	75	61	73	79	73	64	69	73	47	72	68	73	70	
42	J. received 120 votes, M. received 80. What % of total did J. receive	65	61	69	53	62	81	65	56	62	61	40	66	59	67		
43	Cost of 3 items from given menu	95	95	95	95	93	95	95	95	97	95	92	94	95	96		96
44	90 is 75% of ___	65	63	71	55	65	76	65	56	63	67	52	65	59	68		
45	Which decimal smallest	82	79	83	76	82	83	81	78	85	80	64	80	78	85	77	
46	13 boys, 15 girls. What fractional part is boys	52	49	51	48	52	62	50	47	53	48	33	53	46	55	52	
47	Best measure of gasoline tank (liter)	91	89	93	86	91	93	91	89	91	92	80	89	89	93	86	
48	0.009 is equal to what fraction	80	79	82	75	81	85	82	79	74	82	70	81	77	82	74	
49	Area of given 6 by 2 rectangle	75	72	76	69	76	84	74	67	76	74	57	75	72	77		
50	30 in. = ___ft.___inches	90	88	92	84	91	91	90	87	89	92	76	90	88	91	92	
51	Read a circle graph	69	66	69	63	66	79	69	63	73	62	47	67	67	72		70
52	Given formula, find area of triangle	87	84	85	83	92	91	86	84	87	80	69	87	86	87	88	
53	Read size table for socks	94	91	90	93	93	94	95	94	93	90	79	95	91	94	94	
54	8 quarts = ___ gallons	81	79	85	74	80	80	82	83	80	84	68	80	81	82	84	
55	Perimeter of given 10 by 6 rectangle	68	66	71	61	65	75	69	66	66	67	51	67	66	70		
56	Order: 1/4, _?_, 3/8	54	52	64	40	52	61	56	50	53	52	37	55	52	55	57	
57	Eight kilograms equal how many grams	46	45	55	34	45	57	46	45	45	39	34	47	45	47		
58	Which fraction least	79	75	80	70	80	86	80	75	78	72	56	80	76	80		
59	Estimate circumference of circle, given diameter	34	32	40	25	36	45	31	30	33	34	22	32	33	36	32	
60	Best measure between two cities (kilometer)	76	74	81	66	78	81	74	75	76	80	58	78	70	79	77	
61	Find volume of box	78	74	80	69	81	85	78	73	76	72	53	81	76	78	75	
62	Smallest unit? (milligram)	81	77	83	72	79	85	81	78	83	74	57	80	81	81	73	
63	Height of tall tree from short tree	64	60	65	55	64	70	65	56	68	60	39	66	61	64		52
64	Read unemployment graph	87	84	86	82	88	90	89	84	86	88	64	89	82	90		89
65	140 min.=___hrs.___min.	90	87	89	85	91	88	89	90	91	89	70	89	87	91		
66	Which decimal greatest	77	72	76	69	82	80	75	72	77	74	48	76	74	79		76
67	How many blocks to fill crate	75	72	78	67	80	79	74	68	78	75	55	74	71	79		
68	357 centimeters equal how many meters	57	53	61	45	53	61	59	50	56	59	34	54	54	60		
69	Which bar graph gives ages of ten people	91	88	87	90	94	92	90	89	93	90	72	90	89	93		

*Open-ended item

**Regions do not include Big Cities

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*Projected Month Available is synonymous with the month that the report is to be submitted to the State Board for review and approval.

()Indicates that this report is produced in alternate years.

A C K N O W L E D G M E N T S

The 1979-80 Connecticut Assessment of Educational Progress (CAEP) in Mathematics was a joint effort by the Bureau of Research, Planning and Evaluation, the Bureau of Curriculum and Staff Development of the Connecticut State Department of Education (CSDE), and the Mathematics Education Center, School of Education, The University of Connecticut.

The assessment involved substantial effort by many people. Dr. George D. Kinkade and Mr. Steven Leinwand of CSDE were responsible for the overall direction of the assessment. Substantial contributions to the development of testing materials and the interpretation of results were provided by a Mathematics Advisory Committee of Connecticut educators. We extend sincere appreciation for their efforts and involvement to the committee members: Lynn Anderson, Thomas Andreoli, Linda Ball, Robert Carchman, Jean Carnaghan, Frank Levanti, Ann McKinney, and George Spooner.

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